UREDINALES OF CUBA

By J. C. Arthur and J. R. Johnston

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Shoot of *Rivina octandra* distorted by aecia of *Puccinia Rivinae*. Photo by Johnston, 1917.

INTRODUCTION

In a letter recently written by Professor F. S. Earle, the well-known botanist of Cuba, he says: "There is a very varied and interesting fungous flora here, but 'collecting' is not nearly as good as in the States. Field work is difficult, and many species are rare and local. I am curious to see how many rusts you have from here. There are really a great many, but it will take years to find them all." Professor Earle speaks with the knowledge of a mycologist, as he has to his credit some forty published papers dealing with mycological subjects, issued largely in the score of years between 1884 and 1904. Since becoming a resident of Cuba in 1904 he has occasionally gathered specimens of rusts, and he took a prominent part in the rediscovery of the rare *Prospodium plagiopus* at San Marcos in 1909–1910, as stated under that species.

The study of the Cuban Uredinales, or rusts, resulting in the present paper, has abundantly confirmed Professor Earle's statement. Although the first collections of rusts were made in Cuba, doubtless about 1840–45, by Ramon de la Sagra, a few added by Charles Wright in 1855–7, and by others from time to time, yet prior to 1915 the known Cuban rust flora would not have much exceeded half a hundred species. During 1915 the junior author, who had come to Cuba the previous year from a residence of three years in Porto Rico, began to gather material with the intention of publishing in Spanish a pamphlet on the rusts of Cuba for the use of students of the native flora. On February 22, 1916, he wrote to the senior author that "I have apparently so much new material, or at least new hosts, that I can not handle the subject properly under conditions here." He then proposed a joint paper on the rusts of Cuba, in English of course, and the presentation here made is the result.

A study of available material, together with all information which the authors have been able to collect, brings the present list of Cuban rusts up to 112 species, with 28 additional names of rusts belonging to the form-genera *Aecidium* and *Uredo*, which doubtless largely represent additional species whose life histories are too

imperfectly known to permit of their reference to a true genus, Even many of the 112 true species have one or more spore forms yet to be discovered in order to make the life cycle fully known, and to permit a full technical description.

This first published list of Cuban rusts contains a fairly respectable and representative number of species, as is evident by comparing with the Porto Rican list of 110 true species and 42 others belonging to the form-genera *Aecidium* and *Uredo*. The rust flora of Porto Rico is the best known of all the West Indian islands. But Cuba is an island of thirteen times the area of Porto Rico. and with a more varied topography. It is evident, therefore, that the present showing must be accepted as only a beginning to the study of the Uredinales of Cuba.

There have been available for the present study about 470 collections, of which 57 were taken from specimens deposited in phanerogamic herbaria. These collections are represented in the Arthur herbarium. Only one species has been introduced into the list from published records, with no specimen available for examination, and that is the stem rust of wheat (no. 63), the best known and most cosmopolitan of all rusts.

The largest contributors toward material for a list of Cuban rusts have been the men employed since 1904 at the Cuban Agricultural Experiment Station (Estación Experimental Agronómica), located at Santiago de las Vegas, some score of miles from Havana. A large portion of the material has also been contributed by members of the expeditions sent to Cuba by the New York Botanical Garden, beginning in 1903. In addition to these some material has come from individual collectors, mostly while engaged in securing phanerogamic specimens.

Activity in the field of cryptogamic botany at the Cuban station began with the accession of Prof. F. S. Earle to the directorship of the station in 1904, and the contemporaneous and subsequent appointment of able botanists to other positions.

Professor Earle (1904–1906) gave chief attention to the fleshy fungi. Five collections of rusts are credited to him, representing as many species, and eight other numbers in association with other collectors. He retired from the station to his farm at Herradura in the Province of Pinar del Rio, eighty miles to the west-

ward, where he still resides and maintains an interest in mycological studies.

Professor Charles F. Baker was chief of the department of botany in the Cuban station (1904–1907), and has nineteen collections of rusts credited to him, representing sixteen species, with three others as associate collector. He has always been an enthusiastic and tireless botanical explorer. From Cuba he went to the Museo Goeldi at Pará, S. A., then to the College of Agriculture at Los Baños, Philippines, of which he is now Dean.

Mr. Percy Wilson was assistant botanist from July to December, 1904, and collected rusts in connection with Messrs. Earle and Baker. His more extensive association with the rust studies on the island is spoken of later.

Sr. Miguel Zarragoitia y O'Donovan, credited in part with one collection, and with material from phanerogamic collections, was assistant to Professor Baker, and is now employed at Havana in clerical work in the Department of Agriculture.

Sr. Manuel Abarca y Vázquez, credited with two collections, was also assistant to Professor Baker. He is deceased.

Professor Mel. T. Cook, pathologist of the station (1904–1906), had his chief interest in galls produced by insects, but has six collections to his credit, representing five species. He is author of a work on Diseases of Tropical Plants (1913), and has for some years been plant pathologist of the New Jersey College of Agriculture and of the Experiment Station.

Professor Wm. T. Horne was pathologist at the Cuban Station (1904–1909), the first two years being assistant to Professor Cook, and has twenty-three collections of rusts, representing an equal number of species, credited to him. A few of these collections were made during a visit to Cuba in the year 1917. He is now professor of plant pathology in the University of California.

Mr. H. A. Van Hermann, assistant in horticulture (1904–1906), and later chief in horticulture (1914–1916), has the credit of two rust collections, and one other in association with Professor Baker. He was until recently chief in the Office of Vulgarization, and is owner of one of the largest nurseries in Cuba, and well acquainted with the Cuban flora.

Sr. P. Cardin, having one rust collection to his credit, has

been Chief of the Department of Entomology at the Station since 1909.

Mr. S. C. Bruner is assistant pathologist at the station, having been appointed in 1916. He has one rust collection to his credit.

Mr. J. R. Johnston, the associate author of this paper, was pathologist to the station (1914–1917), and is now Chief, and especially in charge of pathology and microbiology, in the Office of Plant Sanitation at Havana. He is credited with 233 collections, representing 96 species, about five sevenths of the total number. He has also supplied much general information, especially in the way of field observations.

The above showing is an interesting indication of the botanical enthusiasm and devotion of the scientific men that have been employed by the Cuban Experiment Station. It becomes all the more noteworthy when it is understood that botanical collecting, and especially collecting of fungi, is not considered at all necessary at this station, and that no systematic effort is made to maintain a cryptogamic herbarium, although incidentally much material has accumulated.

The second group of contributors toward material for the present study has consisted of the men forming the expeditions sent out by the New York Botanical Garden, together with those joining these expeditions for a part of the time. Beside supplying specimens, much assistance has been rendered also by members of the garden staff in determining the hosts and in other services. There have also been much general good will and interest displayed toward this work.

The first expedition from the garden, in which rusts were secured, was in 1903. It was composed of Prof. F. S. Earle and Prof. L. M. Underwood, and was joined for a part of the time by Prof. E. W. D. Holway. Professors Earle and Holway sailed from New York on Feb. 26, and reached Santiago de Cuba on March 5, being joined there by Professor Underwood. After three days a coasting steamer was taken for Baracoa on the north shore, a region where Charles Wright collected in the fifties. Most of the collecting here was done on the slopes of El Yunque. After three days Professor Holway left the party (cf. Jour. N. Y. Bot. Gard. 4: 81–84. 1903), and took steamer for Gibara, and

staging to the railway at Holquin, proceeded to Havana. On the way a few hours' stop was made at Santa Clara. In a few days he left for the north, arriving at Miami, Fla., on March 2. As a result of this trip Professor Holway contributed 42 specimens, representing 34 species of rusts. Messrs. Earle and Underwood left Baracoa on March 19, returning to Santiago de Cuba. After a few days at Alto Cedro, Professor Underwood sailed for Jamaica on March 27, and Prof. Earle for New York on the following day (cf. Jour. N. Y. Bot. Gard. 4: 81–85. 1903). Together they contributed four specimens. The results of the expedition were disappointing, as the time fell in the dry period of an unusually dry season.

An expedition from the New York Garden spent the time between Feb. 21 and April 3, 1910, in Cuba. It was composed of Dr. and Mrs. N. L. Britton and Mr. Percy Wilson, and was joined at Havana by Prof. F. S. Earle. Most of the time was given to the Province of Santa Clara (cf. Jour. N. Y. Bot. Gard. 11: 109–117. 1910), and incidentally eight specimens of rusts were secured.

A second expedition in 1910 spent Aug. 24 to Sept. 23, in western Cuba, exploring the Province of Pinar del Rio. It consisted of Dr. and Mrs. Britton and Dr. C. Stuart Gager, and was joined by Professor Earle (cf. Jour. N. Y. Bot. Gard. 11: 226–236. 1910). Two specimens of rusts were secured.

In 1911 an expedition consisting of Dr. and Mrs. Britton and Mr. J. F. Cowell gave the time between Feb. 22 and the end of March, to an exploration of western and central Cuba (cf. Jour. N. Y. Bot. Gard. 12: 89–95. 1911), securing one rust collection.

The most fruitful expedition in its bearing on the present rust study was in 1916, when Dr. and Mrs. Britton and Mr. Wilson devoted the time between Jan. 29 and March 28, largely to the Isle of Pines. They were joined for a few days by Brother León of the Colegio de la Salle, Havana (cf. Jour. N. Y. Bot. Gard. 18: 64–71. 1916). Heretofore Mr. Wilson had taken an occasional specimen of rust, beginning when connected for a time in 1904 with the Cuban Experiment Station, and continuing to do so on his many subsequent trips to Cuba. But, having become especially interested in the rusts of the island while assisting in the

critical determination of hosts, he gave considerable attention to these fungi during the present expedition. The result was that the two months' exploration yielded some 60 specimens of rusts, largely from the Isle of Pines, and largely collected by Mr. Wilson, part of which represent species, as well as hosts, not otherwise reported. This number is second only in size and importance to the contributions of Mr. Johnston, and considerably larger than the number secured during the first expedition to the island in 1903, when Professor Holway devoted special attention to the rusts, although under unfavorable conditions. Mr. Wilson's intimate knowledge of the phanerogamic flora of Cuba gave him unusual advantage as a collector of parasitic species. The whole insular list, as here presented, has also been made more valuable and accurate by Mr. Wilson's critical examination of the hosts of many collections. While engaged in this helpful study from time to time he detected rusts on the phanerogamic specimens in the herbarium of the New York Botanical Garden, and in this way added to the completeness of the presentation.

Other expeditions to Cuba from the New York Garden are not mentioned here, as they yielded no collections of rusts, although rusts have later been found on the phanerogamic specimens secured by some of them.

The names of a few persons who are credited with collections, and who were not connected at any time with the Cuban Experiment Station or the expeditions of the New York Botanical Garden, should be mentioned.

Ramon de la Sagra* came to Cuba from Spain in 1822 and became professor of botany in the university and director of the botanical garden at Havana. He took great interest in the flora of the island, collecting extensively all kinds of plants, and securing the assistance of many specialists in Europe and especially of P. de Candolle in the determination of the species. By his administrative ability and his numerous important writings he became famous throughout the island, and was assisted in his work by many local collectors. He projected and edited a monumental folio work in twelve volumes on the physical, political and natural

* For brief biographical account by Ignatio Urban, see Symbolae Antillanae 3: 117–118. 1902.

history of Cuba, himself writing the general introduction and the part on climate and agriculture. In 1835 he went to Paris, taking with him his numerous collections. The cryptogams were placed in the hands of M. Montagne, and were described in the ninth volume of the folio work. The specimens are now in the Museum of Natural History at Paris. Only three collections of rusts are accredited to Sagra. Two of these, *Prospodium plagiopus* (*Puccinia plagiopus*), and *Puccinia poculiformis* (*P. graminis*) are cited in the volume by Montagne, and the third, *P. Anthephorae*, is said to have been collected by him. Sagra did not return to Cuba, and in 1871 died in Switzerland.

Mr. Charles Wright* spent nearly ten years in Cuba, between November, 1856, and July, 1867, collecting plants, chiefly phanerogams. The first expedition was confined to the province of Oriente and extended from Nov. 25, 1856, to about Sept. 1, 1857. Most of his fifteen numbers of rusts known to the authors were obtained during this period. Of the later ones only one has been seen by the authors, that on *Limnanthemum*, which was obtained in the province of Pinar del Rio in December, 1858, and is a form which has not been collected by any one else in America. The specimens bear little data, the date of collecting being confined to the years covering the expedition, rarely to the exact year, and the locality to "Cuba," or "in Cuba orientale," if any at all. The rusts form parts of the sets of fungi to be found in the Kew herbarium in London, and in the Herb. Curtis and also the Herb. Gray at Harvard University. The following is a list of the numbers known to the writers.†

275. "*Puccinia Asteris* Schw. on some unknown leaf," in Fungi Cubenses. The species is very rare in the tropics, and must be considered a doubtful determination for Cuba. Specimen has not been seen.

276. *Puccinia solida* B. & C. on "leaves of Compositae," in Fungi Cubenses, = *P. Synedrellae* P. Henn., on *Eleutheranthera ruderalis*. Type in Kew has been examined. See no. 109.

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* For brief biographical account, by Asa Gray, see Am. Jour. Sci. III. **31**: 12–17. 1886; and for an account of Wright's itinerary in Cuba, by L. M. Underwood, see Bull. Torrey Club **32**: 291–300. 1905.

† Most of the numbers are cited in the Fungi Cubenses, by M. J. Berkeley and M. A. Curtis, Jour. Linn. Soc. **10**: 280–391. 1869.

278. *Uromyces gemmatus* B. & C., on "the underside of leaves of *Convolvulus*," in Fungi Cubenses. Host is *Jacquemontia nodiflora*. Type in Kew has not been seen, but apparently the same collection in Herb. Curtis was studied. See no. 51.

279. *Uromyces appendiculatus* Lév., on "leaves of Leguminosae," in Fungi Cubenses. The collection has not been seen, but as the species is common in Cuba, it is doubtless correctly referred. See no. 44.

281. *Puccinia obliqua* B. & C., on "leaves of some plant resembling chickweed," in Fungi Cubenses. Fragment from Kew sent without number, which may be this one, has been examined. The host is reported from Kew as probably *Metastelma penicillatum*. See no. 89.

282. Cited as the second number under *Uromyces gemmatus* in Fungi Cubenses. Fragment of the collection from Kew, and also part of specimen in Herb. Curtis, have been examined. It is *Puccinia Gouaniae* Holw., II, on *Gouania polygama*. See no. 79.

283. *Puccinia heterospora* B. & C., on "the leaves apparently of some malvaceous plant," in Fungi Cubenses. The collection has not been seen, but it is probably correctly referred. See no. 81.

284. *Puccinia deformata* B. & C., on "*Olyra latifolia*, January," in Flora Cubenses. The type at Kew has not been examined, but there is no doubt of the correctness of the naming. See no. 58.

288. *Puccinia obliqua* B. & C. The number is not cited in Fungi Cubenses. A small leaf from the Kew herbarium has been examined and the collection appears to be the same as the one given above as 281. See no. 89.

480. The number is not cited in Fungi Cubenses. A specimen in Herb. Curtis, without data other than the number, has been seen and determined as *Ravenelia portoricensis* Arth., on *Cassia emarginata*. See no. 23.

596. *Puccinia deformata* B. & C., on *Olyra latifolia*. The number is not cited in Fungi Cubenses. A specimen in Herb. Curtis has been examined. See no. 58.

720. *Trichobasis euphorbiaecola* B. & C., on "leaves of some Euphorbia," in Fungi Cubenses. The fragment of this collection

from the Herb. Curtis, which has been seen, shows uredinia, and it is doubtless to be refererd to *Uromyces proeminens*. See no. 48.

727. *Trichobasis labiatarum* Lév., on "leaves of Labiatae," in Fungi Cubenses. A portion of the collection from the Herb. Curt. has been seen, but the species represented remains uncertain. It may be some species on *Leonotis*, *Hyptis*, or *Salvia*.

730. *Puccinia Cynanchi* Schw., on "the leaves and stem of some Asclepiad," in Fungi Cubenses. The collection has not been seen, although the type of *P. Cynanchi* from Surinam has been examined, and the Wright collection may well be the same species. It is now referred to *P. Gonolobi*. See no. 88.

756. *Aecidium Rivinae* B. & C., on "racemes of *Rivina octandra*," in Fungi Cubenses. The collection has not been seen, but there is no doubt regarding the names. The species is now referred to *Puccinia Rivinae* (B. & C.) Speg. See no. 74.

929. A collection in the Herb. Curtis, which has been examined, is labelled *Aecidium Nymphaearum* DC., on *Limnanthemum Grayanum* Griseb., and doubtless correctly so. The species is now referred to *Puccinia Scirpi*. See no. 69.

Mr. Otto E. Jennings, accompanying a natural history expedition* from the Carnegie Museum of Pittsburgh, Pa., collected in the Isle of Pines from May 5 to May 26, 1910. One rust collection (cf. no. 89), and one phanerogamic specimen bearing a rust (cf. no. 60), were obtained at this time.

Beside the above collectors of fungi, who have enriched our knowledge of the rust flora of Cuba, there are some fourteen botanists, whose names appear in the following list in connection with phanerogamic specimens from the island, found to bear rusts. Altogether half a hundred botanists are represented as field collectors in the present account of the rusts of Cuba, to whom is due the credit of making material available as a basis for this first account of the Cuban rusts.

Comparison of the list as it now stands with the list of rusts for Porto Rico, bringing the last published account of the latter up to date in order to make the two more accurately comparable, shows a close agreement in the number and kind of genera and in

* For some account of the expedition and of the topography and floristic conditions on the Isle of Pines, see Am. Fern Jour. 1: 129–136. 1911; and Ann. Carnegie Mus. 11: 19–290. 1917.

the number of species in each genus, as well as in the comparative numbers of long- and short-cycle forms. The differences are only such as might be expected from incomplete exploration. The greater total number of species now known for Porto Rico is chiefly accounted for by the greater number of unconnected *Uredo*-forms, which have been found in that island. Whether this array of forms still under the genus *Uredo* indicates that the flora of Porto Rico is more tropical than that of Cuba, or whether it is better known for such forms, is doubtless debatable.

A comparison of the Cuban with a continental area presents marked differences. The most instructive comparison at present possible is that with Guatemala. A recent study of the Uredinales of Guatemala, not yet published, gives a list of species about as complete for that country, as that here presented for Cuba. Nearly a third of the area of Guatemala, especially the northern part in the Department of Peten, is unrepresented by collections. The remainder of the country is of about the area of Cuba, but of a more varied topography, having many high mountains. The climate is doubtless somewhat more tropical that that of Cuba, although northern species find congenial conditions in the high altitudes. Thus the genera *Melampsora*, *Melampsoridium*, *Pucciniastrum*, *Uropyxis*, and *Phragmidium*, not represented in Cuba or Porto Rico, are to be found there. Also the forms under *Uredo* are only about one half those in Cuba and one third those in Porto Rico. Both classes of facts indicate certain less tropical aspects of the flora, but nevertheless, they are aspects that may have to do with the boreal features of the mountainous part of the flora. There are, however, three genera, that is, treating the correlated *Uromyces* and *Puccinia* as a single genus, which can be taken as comparable factors to indicate differences between the insular and continental floras.

NUMBER OF SPECIES OF RUSTS

	Cuba	Porto Rico	Guatemala
Coleosporium	5	3	8
Ravenelia	9	10	20
Puccinia-Uromyces	76	74	150
	90	87	178

The table indicates the presence in Cuba or in Porto Rico of only half as many species in each of the three genera, *Coleosporium*, *Ravenelia*, and *Puccinia-Uromyces*, or in all combined, as occur in Guatemala. The difference in abundance may be ascribed to the differences between insular and continental conditions, or to the diversity of topography, or to both factors combined.

The only genera represented in Cuba, not found in the other West Indian islands, or the nearby continent, are *Sphaerophragmium* and *Uromycladium*, both based somewhat doubtfully upon material needing further field observations and study. The seemingly greater similarity to the rust flora of southern Florida and the regions bordering the Gulf of Mexico, than is shown by the rust flora of Porto Rico, has been previously pointed out,* as well as the surprisingly large number of short-cycle species. To go into a more detailed comparison of the Cuban rust flora with that of other regions is not likely to be particularly profitable at the present time owing to the imperfect data available, not only for Cuba, but even more so for most regions with which it might be compared.

In the following enumeration twelve species are described as new, and five species are transferred to other genera, making new combinations. Most of the changes in genera are due to finding additional spore forms, but some are in the nature of quite new discoveries, as in the case of *Uromyces cristatus*, which was embalmed under the name of *Uredo*, although not itself uredinial, or belonging to a species having a uredinial stage.

The list introduces 15 species new to the North American flora, of which 10 species are exclusively Cuban, so far as present knowledge extends, the others being mostly South American forms.

In conclusion it may be said that the present enumeration of 140 species of Cuban rusts must be considered only the basis for a thoroughly scientific and economic exploration of the island for this group of obligate parasites. When sufficient taxonomic data are finally accumulated the still more interesting task of studying the species in relation to their distribution, the abundance from year to year, their origin on the island, and their relation to economic problems, can be taken up with interest and profit. The

* Arthur, Rusts of the West Indies. Torreya 17: 24–27. 1917.

study of the rusts opens a field that is likely to prove very attractive to Cuban scholars, as it has been to others not so familiar with insular conditions.

Map of Cuba, with scale of miles, showing the provinces: *A*, Pinar del Rio; *B*, Habana; *C*, Matanzas; *D*, Santa Clara; *E*, Camagüey; *F*, Oriente; *G*, Isle of Pines. Some of the principal cities and towns are also indicated.

The microscopical study of the material on which this paper is based was done in the laboratory of the botanical department of the Purdue University Agricultural Experiment Station at Lafayette, Indiana, as part of the preliminary work on the rust portion of the North American Flora. Thanks are due to Pro- H. S. Jackson, chief of the department, and to his assistants, for their assistance.

Family: **Coleosporiaceae**

1. COLEOSPORIUM ELEPHANTOPODIS (Schw.) Thüm. Myc. Univ. 953. 1878.

ON CARDUACEAE:

Elephantopus mollis H. B. K., El Yunque, Baracoa (Prov. Oriente), March 12, 1903, *Holway;* La Cunagua, Isle of Pines, Feb. 19, 1916, II, *Britton, Britton & Wilson 14554;* San Pedro, Isle of Pines, Feb. 12–March 22, 1916, II, *Britton, Britton & Wilson 15808;* Baracoa (Prov. Oriente), April 14, 15, 1916, *Johnston 504, 507.*

The species is heteroecious, having aecia on leaves of pine. In tropical regions it is doubtless maintained by the repeating urediniospores. It occurs in Porto Rico, Jamaica, and St. Vincent, but is more abundant on the continents, both north and south.

2. COLEOSPORIUM VERNONIAE Berk. & Curt. Grevillea 3: 57. 1874.

ON CARDUACEAE:

Lachnorhiza piloselloides A. Rich., San Pedro, Isle of Pines, Feb. 12–March 22, 1916, II, *Britton & Wilson 14713*.

The first record of the species for the West Indies. The host is also new for the species. Northward aecia occur on pine leaves.

3. COLEOSPORIUM IPOMOEAE (Schw.) Burr. Bull. Ill. Lab. Nat. Hist. 2: 217. 1885.

ON CONVOLVULACEAE:

Ipomoea cathartica Poir. (*I. acuminata* R. & S., *Pharbitis cathartica* Choisy), Rincón (Prov. Habana), Sept. 26, 1915, *Johnston 156*.

Ipomoea mutabilis Lindl. (*I. Learii* Meissn. not Paxton) Vedado (Prov. Habana), Dec. 6, 1916, *Johnston 926;* Consolación del Sur (Prov. Pinar del Rio), March, 1917, II, *Horne*.

Ipomoea stolonifera (Cyrill.) Poir., Siguanea, Isle of Pines, Feb. 26, 1916, II, *Britton, Britton & Wilson 14936*.

Also found in the phanerogamic herbarium at the N. Y. Bot. Garden on *Jacquemontia tamnifolia* (L.) Griseb., collected by *Eugenio Cuesta 329*, at Pinar del Rio, December, 1911.

The species is heteroecious, with aecia on leaves of pines, but in tropical regions is probably maintained by the repeating urediniospores. In the West Indies it is also known from Porto Rico and St. Croix, but is more common on the continents to the north and south.

4. COLEOSPORIUM PLUMIERAE Pat. Bull. Soc. Myc. Fr. 18: 178. 1902.

ON APOCYNACEAE:

Plumiera emarginata Griseb., Limones Cienfuegos (Prov. Santa Clara), Nov. 4, 1915, II, *Johnston 216;* Marianao (Prov. Habana), Oct. 31, 1915, II, *Johnston 236*, Feb. 6, 1916, *Johnston 441;* Caleta Cocodrilos, Isle of Pines, March 8, 1916, II, *Britton, Wilson & León 15300*.

Plumiera obtusa L., Santiago de las Vegas, June 21, 1906, *Cook*.

Plumiera rubra L., Santiago de las Vegas, Sept. 4, 1904,

Baker 1378, May 9, 1906, *Baker* (Barth. Fungi Columb. *2217*), April 4, 1906, *Horne 18*, June 21, 1906, *Cook;* Limones Cienfuegos (Prov. Santa Clara), Nov. 4, 1915, II, *Johnston 227*.

This West Indian rust is undoubtedly heteroecious, but with aecia yet unknown. The telia are rarely produced and the continuance of the species is probably by urediniospores. It is also known from Porto Rico and Guadeloupe.

5. COLEOSPORIUM EUPATORII Arth. Bull. Torrey Club 33: 31. 1906.

ON CARDUACEAE:

Eupatorium macrophyllum L., El Yunque, Baracoa (Prov. Oriente), March 12, 1903, II, *Holway;* Taco Taco (Prov. Pinar del Rio), Sept. 17, 1916, II, *Johnston 875*.

This species is undoubtedly heteroecious, like other species of the genus. It is at present known only in the uredinial stage, and there is much likelihood that when more fully studied may be united with earlier named species on other hosts. It was also detected in the phanerogamic herbarium of the N. Y. Bot. Garden, on same host from Trinidad Mountains (Prov. Santa Clara), March 6, 1910, II, *Britton & Wilson 5134*. It is also known from Guatemala, Nicaragua, and from South America.

Family: **Uredinaceae (Melampsoraceae)**

6. PHAKOPSORA VITIS (Thüm.) Syd. Hedwigia Beibl. 38: 141. 1899.

Physopella Vitis Arth. Résult. Sci. Congr. Bot. Vienne 338. 1906.

ON VITACEAE:

Vitis vinifera L., Havana, March 21, 1903, *Holway;* Santiago de las Vegas, May 13, 1916, *Johnston 701*.

This imperfectly known rust has not been found on any native grape in America. The collections are treated under the name *Vitis vinifera*, but no adequate examination of the cultivated hosts has been made to substantiate this assignment. The species is abundant in Porto Rico and Jamaica, as well as in the warmer parts of North and South America and Japan, and is often quite injurious to cultivated grape vines.

7. PHAKOPSORA VIGNAE (Bres.) Arth. Bull. Torrey Club **44**: 509. 1917.

Uredo Vignae Bres. Rev. Myc. **13**: 66. 1891.

Uredo concors Arth. Mycologia **7**: 330. 1915.

Physopella concors Arth. Mycologia **9**: 60. 1917.

ON FABACEAE:

Genus and species undet., Herradura (Prov. Pinar del Rio), March, 1917, II, *Horne*.

Only uredinia of this species are yet known. The type of *Uredo Vignae* came from St. Thomas and of *U. concors* from Porto Rico. The species will doubtless be found eventually on other West Indian islands.

8. PHAKOPSORA AESCHYNOMENIS Arth. Bull. Torrey Club **44**: 509. 1917.

Uredo Aeschynomenis Arth. Bot. Gaz. **39**: 392. 1905.

Physopella (?) *Aeschynomenis* Arth. N. Am. Flora **7**: 104. 1907.

ON FABACEAE:

Aeschynomene americana L., Santiago de las Vegas, Nov. 6, 1916, II, *Johnston 920*.

Only uredinia of this species are yet known. It occurs also in Porto Rico, as well as in Mexico and South America.

9. CEROTELIUM FICI (Cast.) Arth. Bull. Torrey Club 44: 509. 1917.

Uredo Fici Cast.; Desmaz. Pl. Crypt. *1662*. 1848.

Uredo ficicola Speg. Anal. Soc. Ci. Argent. **17**: 120. 1884.

Uredo ficina Juel, Bih. K. Sv. Vet.-Akad. Handl. 23^{10}: 25. 1897.

Uredo moricola P. Henn. Hedwigia **41**: 140. 1902.

Physopella ficina Arth. N. Am. Flora **7**: 103. 1907.

Physopella Fici Arth. N. Am. Flora **7**: 103. 1907.

Kuehneola Fici Butler, Ann. Myc. **12**: 76. 1914.

ON ARTOCARPACEAE:

Ficus Carica L., Santiago de las Vegas, March 13, 1906, *Horne 15*, July 21, 1906, *Cook;* Limones Cienfuegos (Prov. Santa Clara), Nov. 4, 1915, II, *Johnston 215;* Omaja (Prov. Oriente), March 30, 1916, II, *Johnston 547;* Paso Estancia (Prov. Oriente), May 3, 1916, II, *Johnston 685*.

Ficus Combsii Warb., San Diego de los Baños (Prov. Pinar del Rio), Feb. 7, 1915, II, *Johnston 175;* Minas (Prov.

Camagüey), Dec. 2, 1915, *Johnston 371;* Marianao (Prov. Habana), Feb. 6, 1916, II, *Johnston 443.*

The full life history of this rust is not known. No telia have been found in America, and no pycnia anywhere. It is cosmopolitan throughout the tropics, but in the West Indies is only recorded from Cuba and Porto Rico.

10. CEROTELIUM GOSSYPII (Lagerh.) Arth. Bull. Torrey Club **44**: 510. 1917.

Aecidium desmium Berk. & Br. Jour. Linn. Soc. **14**: 95. 1873.
Uredo Gossypii Lagerh. Jour. Myc. **7**: 48. 1891.
Kuehneola Gossypii Arth. N. Am. Flora **7**: 187. 1912.

ON MALVACEAE:

Gossypium acuminatum Roxb., Santiago de las Vegas, March, 1903, II, *Underwood & Earle 159.*

Gossypium sp., Santiago de las Vegas, August, 1904, II, *Baker* (Barth. Fungi Columb. *2489*).

This rust is still imperfectly known, as the pycnia have not been found. It is rather common upon wild and cultivated cottons in both hemispheres, but in the West Indies is reported only from Cuba and Porto Rico.

11. KUEHNEOLA MALVICOLA (Speg.) Arth. N. Am. Flora **7**: 187. 1912.

Uredo malvicola Speg. Anal. Soc. Ci. Argent. **17**: 124. 1884.
Uredo Hibisci Syd. Hedwigia Beibl. **40**: 128. 1901.

ON MALVACEAE:

Hibiscus syriacus L., Santiago de las Vegas, March 14, 1906, II, *Horne 14.*

Malvaviscus Sagreanus A. Rich., Santiago de las Vegas, Oct. 23, 1906, II, *Johnston 904.*

An imperfectly known species, the pycnia not having been seen. It is not an uncommon species in the southern United States, Central America, and parts of South America, but from the West Indies only one other collection is known, which was obtained by Whetzel & Olive in Porto Rico, on *Malache scabra* (Mycol. **9**: 63. 1917).

12. **Cronartium notatum** (Arth.) comb. nov.

Uredo notata Arth. Mycologia **9**: 89. 1917.

ON MALPIGHIACEAE:

Byrsonima crassifolia (L.) H. B. K., San Marcos (Prov. Santa Clara), Nov. 18, 1915, II, *Johnston 186;* Las Tunas (Prov. Oriente), March 29, 1916, ii, III, *Johnston 545*.

The rust has previously only been known from Porto Rico, and in the uredinial stage. The fine specimen obtained by Mr. Johnston at Las Tunas provides the following characters for the telial stage.

Telial columns hypophyllous, somewhat grouped, rather numerous, cylindrical, moderately stout and short, 1–1.5 mm. long, 90–145 μ broad, chestnut-brown; teliospores oblong, 17–26 by 45–64 μ, obtuse or truncate at both ends; wall yellow, 2–3 μ thick, smooth.

The species differs from *C. Byrsonimatis* P. Henn., known from South America on *B. coccolobifolia*, by the somewhat larger urediniospores, with their walls less thickened at apex, the conspicuous development of imbricated paraphyses, and by the thicker-walled teliospores.

It might be well to call attention to the possibility that this rust, instead of being heteroecious, as in species of temperate regions, may be autoecious. There is an aecial form in Mexico on this host, first described as *Endophyllum singulare* D. & H., which from its morphology may well belong here.

13. **Cronartium Wilsonianum** sp. nov.

ON VITACEAE:

Cissus rhombifolia Vahl, San Juan, Isle of Pines, March 15, 17, 1916, II, III, *Britton, Britton & Wilson 15552*.

Uredinia chiefly hypophyllous, numerous, scattered, sometimes crowded in small groups, round, small, 0.2 mm. or less in diameter, dehiscent by a central rupture, soon wide open, pulverulent, very pale straw-color; paraphyses apparently free, peripheral, incurved, clavate, 13–15 by 35–40 μ, the wall very pale yellow or colorless, thin, about 1 μ, smooth; urediniospores broadly ellipsoid or obovoid, 18–21 by 24–27 μ; wall pale yellow or colorless, thin, 1.5 μ or less, sparsely and very sharply and prominently echinulate, the pores obscure.

Telial columns hypophyllous, 2–3 mm. in length, about 70 μ thick, filiform, dark chestnut-brown; teliospores terete or fusiform,

10–13 by 48–61 μ, usually obtuse at both ends; wall pale cinnamon-brown, thin, about 1 μ, smooth.

A distinctive species, appearing in abundance over the large leaves of the host. The form of the uredinial envelope is especially interesting, free paraphyses being a novelty in the genus.

A uredinial specimen on the same host was collected by Lagerheim near Quito, Ecuador, June, 1890, which was given a herbarium name by the collector not established by description or publication.

It is doubtful if this is a heteroecious rust, like the members of the genus occurring in northern regions. Information to complete the life history will be of special interest.

The species is named in recognition of the botanical services of Mr. Percy Wilson of the N. Y. Botanical Garden in making known the flora of Cuba, and especially the rust flora. Mr. Wilson's numerous collections of Cuban rusts, made largely in 1916, added much to previous knowledge, and his patient and critical examination of the hosts for most of the collections in this list has added immensely to the accuracy and value of their citation.

14. **Cionothrix Cupaniae** sp. nov.

ON SAPINDACEAE:

Cupania americana L., Ceballos (Prov. Camagüey), March 24, 1916, *Johnston 668*.

Cupania glabra Sw., Paso Estancia (Prov. Oriente), May 3, 1916, *Johnston 679, 694* (type), *696*.

Telial columns hypophyllous, in groups on discolored and somewhat thickened areas, 3–5 mm. across, a mammiform swelling forming the base from which each column arises, cylindrical, short, rigid, 0.3–0.5 mm. long, 19–35μ wide, colorless; teliospores fusiform, 7–15 by 40–65μ, tapering at both ends; wall colorless, thin, 1μ or less, colorless.

No indication of uredinia were found on the type, *no. 694*, or other collections, and for this reason the species is issued under the short-cycle genus, *Cionothrix*, even though pycnia were not seen. Sections of young telia show the young catenulate spores arising in a layer, like cylindrical hyphae with transverse septa, and with no indication of peridium or paraphyses.

Family: **Aecidiaceae** (**Pucciniaceae**)

15. RAVENELIA INDIGOFERAE Tranz. Hedwigia 33: 369. 1894.

ON FABACEAE:

Indigofera suffruticosa Mill. (*I. Anil* L.), Baracoa (Prov. Oriente), March 9, 1903, II, *Holway;* Santiago de las Vegas, March 15, 1905, II, III, and April 5, 1906, II, iii, *Horne*, Jan. 15, 1907, II, III, *Baker 3055* (Barth. Fungi Columb. *2475*), July 15, 1915, II, *Johnston 157;* Consolación del Sur (Prov. Pinar del Rio), Feb. 2, 1915, II, *Johnston 141;* Santiago de las Vegas, Nov. 29, 1917, II, III, *Johnston 953*.

The species, like all other rusts referred to the genus *Ravenelia* in this paper, is autoecious, the life cycle including pycnia, uredinia, and telia, although no pycnia have yet been seen in this species. The other West Indian islands where it has been found are Jamaica, Porto Rico, and Bermuda. It also occurs in Mexico and South America.

16. RAVENELIA PISCIDIAE Long, Jour. Myc. **12**: 234. 1906.

ON FABACEAE:

Ichthyomethia Piscipula (L.) A. S. Hitchc., Ensenada de Siguanea, Isle of Pines, Feb. 18, 1916, II, III, *Britton, Wilson & Selby 14533*, Feb. 25, 1916, II, III, *Britton & Wilson 14849;* San Juan, Isle of Pines, March 15, 17, 1916, II, III, *Britton, Britton & Wilson 15449*.

This rust heretofore has been known only from southern Florida. No pycnia have yet been discovered for the species.

17. RAVENELIA LONCHOCARPI Lagerh. & Diet. Hedwigia 33: 46. 1894.

ON FABACEAE:

Lonchocarpus latifolius H. B. K., Ceballos (Prov. Camagüey), March 24, 1916, II, *520*, *530*, April 6, 1916, II, *627*, *665*, *666;* Baracoa (Prov. Oriente), April 14, 1916, II, *638*, all by *Johnston*.

Heretofore the species has been known only from Brazil, and on *Lonchocarpus campestris*. The ample material supplied by Mr. Johnston shows an abundance of uredinia, agreeing closely with the uredinial part of the original description, no Brazilian specimen having been seen. No pycnia or telia could be detected.

18. RAVENELIA SILIQUAE Long, Bot. Gaz. **35**: 118. 1903.

ON MIMOSACEAE:

Vachellia Farnesiana (L.) W. & A. (*Acacia Farnesiana* Willd.), Santiago de Cuba, April 30, 1916, II, *Johnston 684*.

This collection, the first one seen from the West Indies, shows the usual abundance of uredinia on the pods. The species also occurs in Central Mexico. No pycnia or telia are known for it, and it has until recently been taken only on the fruit of the host. Long (Bot. Gaz. **64**: 64. 1917) reports it on branches and leaves.

19. RAVENELIA PITHECOLOBII Arth. Bot. Gaz. **39**: 394. 1905.

ON MIMOSACEAE:

Pithecolobium tortum Mart., Sierra de los Ceballos, Isle of Pines, March 2, 1916, III, *Britton & Wilson 15358*.

This is the first record of the species for the West Indies, being previously known from southern Florida and Mexico, and is also the first record for this species of host. The pycnia of the species are yet unknown.

20. RAVENELIA LYSILOMAE Arth. Bot. Gaz. **39**: 392. 1905.

Dendroecia Lysilomae Arth. Résult. Sci. Congr. Bot. Vienne 340. 1906.

ON MIMOSACEAE:

Lysiloma bahamensis Benth., Punta Sabanilla, Cienfuegos Bay (Prov. Santa Clara), Feb. 24, 1910, III, *Britton, Earle & Wilson 4586*.

This collection shows telia but no uredinia, although a few urediniospores are present. The species was originally placed in the genus *Dendroecia* on evidence similar to this. Dietel states (Beih. Bot. Centr. **20**: 375. 1906) that well-developed uredinia were found by him upon the type collection, made by E. W. D. Holway at Iguala, Mexico, on *L. tergemina*. A more ample portion of this collection than was originally available has enabled the senior author to confirm the statement made by Dietel. On this evidence, which completes the life history, the species is returned to the genus *Ravenelia*, where it evidently belongs. The above collection gives the first station known outside of Mexico, and adds another species of host.

21. RAVENELIA HUMPHREYANA P. Henn. Hedwigia **37**: 278. 1898.
Ravenelia pulcherrima Arth. Bot. Gaz. **39**: 395. 1905.

ON CAESALPINIACEAE (CASSIACEAE):

Caesalpinia bahamensis Lam. (*C. Rugeliana* Urban), Santa Clara to Loma Cruz (Prov. Santa Clara), March 22, 1911, II, *Britton, Britton & Cowell 10225* (host no. *10224*).

Poinciana pulcherrima L. (*Caesalpinia pulcherrima* Sw.), Holguin (Prov. Oriente), March 17, 1903, II, III, *Holway;* Soledad (Prov. Santa Clara), Nov. 4, 1915, II, *Johnston 221;* Santiago de las Vegas, Nov. 3, 1917, II, *Johnston 950.*

The pycnia for this species have not yet been found. Type collection for the species came from Mexico. The species is known also from Jamaica and Guatemala. The first host named is a new one.

22. **Ravenelia cubensis** sp. nov.

ON CAESALPINIACEAE:

Cassia robinaefolia Benth., Cacocum (Prov. Oriente), April 6, 1916, *Johnston 531.*

Uredinia amphigenous, scattered or somewhat grouped, round, 0.2–1 mm. across, subepidermal, rather tardily naked, cinnamon-brown, pulverulent, ruptured epidermis conspicuous; paraphyses none; urediniospores ellipsoid or obovoid, 16–19 by 23–26μ; wall golden- or light cinnamon-brown, rather thin, 1–2μ, thicker at apex, 3–6μ, moderately and finely echinulate, the pores 4, equatorial.

Telia unknown.

This rust is so evidently a *Ravenelia*, that it is unhesitatingly described as such, although no telia are yet known.

23. RAVENELIA PORTORICENSIS Arth. Bull. Torrey Club **31**: 5. 1904.

ON CAESALPINIACEAE:

Cassia emarginata L., without locality or date, II, *Charles Wright 480;* Santiago de Cuba (Prov. Oriente), March 6, 1903, II, *Holway;* same, April 30, 1916, II, *Johnston 683.*

Heretofore this rust has been known chiefly from Porto Rico. One collection is recorded from Jamaica, and Mr. Percy Wilson has communicated two specimens found in the phanerogamic her-

barium of the New York Botanical Garden, one from Barahona, St. Domingo, May, 1910, II, *Pater Fuertes 192*, and the other from San Michel, Hayti, Aug. 5, 1905, ii, *Nash & Taylor 1393*. A part of a collection made by Charles Wright in Cuba, bearing no data except the number 480, has been sent by Dr. W. G. Farlow from the Curtis collection, which proves to be the uredinial stage of this species. All collections of the species so far seen have been found to be on *Cassia emarginata*.

24. **Uromycladium** (?) **cubense** sp. nov.

ON MIMOSACEAE:

Mimosa pigra L. (*M. asperata* L.), Soledad Cienfuegos (Prov. Santa Clara), Nov. 6, 1915, *Johnston 191*.

Telia amphigenous, emaculate, scattered, oval or oblong, 0.2–0.4 by 0.5–1 mm., subcuticular, soon naked, pulverulent, chestnut-brown, ruptured cuticle conspicuous, teliospores triangular-obovate, or short-pyriform, length and breadth the same, 15–18 μ, remaining attached to pedicel in groups of 1–4 (usually 2); wall at sides colorless, smooth, and thin, 1 μ, above chestnut-brown, finely and closely verrucose, 1.5–2 μ thick; pedicel in upper part firm, remaining attached to spores, chestnut-brown, 7–9 μ broad, 7–10 μ long, the wall about 1.5 μ thick, part below colorless, thin-walled, collapsing and readily falling away.

This unique rust does not drop readily into any genus. It is placed tentatively in *Uromycladium*, although the spores are not clearly arranged in series on the pedicel, and no cyst is present. There are other variations, as for instance, the lack of an evident germ pore, as well as the absence of uredinia and pycnia. Moreover, *Uromycladium* has heretofore been accounted a peculiarly Australian genus.

25. CALLIOSPORA FARLOWII Arth. Bot. Gaz. **39**: 391. 1905.

ON FABACEAE:

Parosela domingensis (DC.) Heller (*Dalea domingensis* DC.), Vento (Prov. Habana), Aug. 26, 1905, *Baker 3312*.

This short-cycle rust, having pycnia and telia, is known only on the one species of host, and only from Cuba and Mexico.

26. TRANZSCHELIA PUNCTATA (Pers.) Arth. Résult. Sci. Congr. Bot. Vienne 340. 1906.

Aecidium punctatum Pers. Ann. Bot. Usteri **20**: 135. 1796.

Puccinia Pruni-spinosae Pers. Syn. Fung. 226. 1801.

ON AMYGDALACEAE:

Amygdalus Persica L. (*Prunus Persica* Sieb. & Zucc.), Santiago de las Vegas, Sept. 27, 1915, II, *Johnston 166*.

The collection shows only uredinia, and these not in much abundance. The species is heteroecious, having its aecia on *Anemone*, *Hepatica*, and *Thalictrum*. It is a common rust throughout tropical and temperate regions of both hemispheres, but only three collections have been seen from the West Indies, one each from Cuba, Porto Rico, and Bermuda, and all being uredinia and on same host.

27. PROSPODIUM APPENDICULATUM (Wint.) Arth. Jour. Myc. **13**: 31. 1907.

Puccinia appendiculata Wint. Flora **67**: 262. 1884.

ON BIGNONIACEAE:

Stenolobium stans (L.) D. Don (*Tecoma stans* Juss.), Holguin (Prov. Oriente), March 17, 1903, *Holway*, Havana, March 22, 1903, *Holway* (Barth. N. Am. Ured. *724*); Santiago de las Vegas, Feb. 28, 1916, *Johnston 469*.

The species is common in tropical regions, and is autoecious, possessing pycnia, uredinia, and telia. The only other West Indian island represented is Porto Rico.

28. PROSPODIUM PLAGIOPUS (Mont.) Arth. N. Am. Flora 7: 162. 1912.

Puccinia plagiopus Mont. Pl. Cell. Cuba 294. 1842.

ON BIGNONIACEAE:

Tecoma lepidota (H. B. K.) DC., San Marcos (Prov. Santa Clara), without date, II, iii (*Ramon de la Sagra?*); same locality, Sept. 26, 1910, II, *F. S. Earle;* Palm barrens east of Guanabacoa (Prov. Habana), April 2, 1910, II, iii, *Britton, Earle & Wilson 6264* (host no. *6257*).

Tecoma pentaphylla (L.) Juss., Santo Domingo (Prov. Santa Clara), Nov. 7, 1915, II, *Johnston 183;* Havana, Feb. 26, 1916, *Johnston 491;* San Juan, Isle of Pines, March 15, 17, 1916, II, *Britton, Britton & Wilson 15471*.

The species is an autoecious one with uredinia and telia, preceded undoubtedly by pycnia, which have not yet been seen. It was described originally by C. Montagne, who prepared the volume of cryptogams which was part of the encyclopedic work on the

physical, political, and natural history of Cuba, issued irregularly in parts about 1840 65, both from Paris and Havana. The volumes 9 12, treating of natural history, were edited and in part written by Ramon de la Sagra, volume nine being Montagne's treatment of the cryptogams, the material for which is generally understood to have been collected by de la Sagra. An excellent description of this species was given by Montagne under the name *Puccinia plagiopus*, together with figures of both kinds of spores, and also of the coriaceous leaflet and peltate hair of the host. The reason for figuring the unusual form of hairs was not to help in the identification of the host, which was said to be wholly unknown (*mihi prorsus ignota*), but because the writer thought he had discovered a remarkable metamorphosis, by which the peltate hair became the envelope surrounding each group of spores. The circle of paraphyses bounding each sorus forms a unique fimbriated structure supported on a pedicel-like base, and easily detachable as a whole, having about the size and color of the plant-hairs, so that the error of interpretation was a natural one.

No further information regarding this rust became available until the original collection was restudied by Monsieur P. Hariot of the Paris Museum (Bull. Soc. Myc. Fr. 7: 196. 1891) half a century later. After an extended discussion he expresses the opinion that it doubtless constitutes the basis of a new genus related to *Puccinia*, *Phragmidium*, and *Uropyxis*, having urediniospores surrounded by a membrane, teliospores with a *Uropyxis*-like, gelatinous covering, and "no paraphyses." However, with only one specimen in the herbarium he hesitates to establish the genus (*il serait téméraire de se prononcer*). The paraphysate structure, which Montagne thought might be a transformed hair of the host, is described by Hariot as a hyaline halo in form of a collar with wavy edge, but he does not associate the term paraphyses with it, hence his nascent genus is said to be without paraphyses.

Hariot attempted to advance the identity of the host by suggesting that the nature and form of the hypophyllous hairs indicated a member of the Oleaceae, a statement followed in Sydow's Monographia Uredinearum (1: 345. 1902).

When working on the second part of the rust portion of the

North American Flora the senior author observed the peculiarity of appendaged pedicels described by Montagne, and thought the species might be a member of the newly erected genus *Prospodium*. An appeal was made to M. Hariot in March, 1909, for a fragment of the original Cuban collection, which was most kindly sent, and which confirmed the suggestion. Some months previous to this the Pflanzenfamilien of Engler & Prantl had been searched for some illustration which would give the kind of leaf or leaflet figured by Montagne, without much success, although similar hairs were illustrated under Bignoniaceae. In January, 1909, the herbarium of the N. Y. Bot. Garden was searched for a similar purpose, and again with no better success. Going from New York to Washington, the National Museum yielded two sheets, possibly two collections, from Cuba by Charles Wright, made in 1865, locality not given, labelled *Tecoma lepidota* DC., which showed compound leaves with leaflets that quite well answered to the requirements in Montagne's record. With this aid the assistance of Prof. F. S. Earle, a sometime student of the rusts, was sought. Prof. Earle was at that time stationed at Jovellanos, about 80 or 100 miles west of San Marcos, the type locality. A statement of the situation, with a drawing of the leaf as given by Montagne, was sent in February, 1909. A hasty visit to the locality made by Prof. Earle in April, 1909, yielded no results, but in September, 1910, he transmitted two leaflets from "a Catalpa-like shrub with 5-parted leaves," and the statement that "at last I am able to send you what I take to be your long desired rust from the type locality; I chanced to stop with friends at San Marcos today [Sept. 26] and found one shrub with a few infected leaves." This collection gave uredinia only, but there was little doubt about its being the Montagne species. The host was still unnamed. In only a few weeks, however, an ample collection with telia and uredinia was received from Dr. N. L. Britton, collected in another part of the island, which supplied details for both host and rust, and the long search for definite knowledge of this curious rust and its obscure host was successfully ended. The result shows that the rust is curious, as stated by Montagne, that it is worthy of being placed in a separate genus related to *Puccinia*, *Phragmidium*, and *Uropyxis*, as believed by M. Hariot. Finally,

another species of host for it was discovered by the junior author (1912), within the same limited region, and later by Whetzel and Olive (1916) in Porto Rico.

29. PROSPODIUM AMPHILOPHII (Diet. & Holw.) Arth. Jour. Myc. 13: 31. 1907.

Puccinia Amphilophii Diet. & Holw. Bot. Gaz. 24: 30. 1897.

ON BIGNONIACEAE:

Pithecoctenium echinatum (Aubl.) K. Schum., Caleta Cocodrilos, Isle of Pines, March 8, 1916, II, III, *Britton, Wilson & León 15274.*

This long-cycle rust has heretofore been known only from Mexico.

30. PROSPODIUM LIPPIAE (Speg.) Arth. N. Am. Flora 7: 161. 1912.

Puccinia Lippiae Speg. Anal. Mus. Nac. Buenos Aires 6: 224. 1898.

ON VERBENACEAE:

Lippia dulcis Trev., Cacocum (Prov. Oriente), April 6, 1916, II, *Johnston 550.*

The species has not before been reported from the West Indies. It is known from Mexico, Central America, and South America.

The urediniospores are somewhat smaller than those of other collections examined, with pores less evident, but other characters of spores and sori, even to the inconspicuous paraphyses, are the same.

31. PROSPODIUM TUBERCULATUM (Speg.) Arth. N. Am. Flora 7: 161. 1912.

Puccinia tuberculata Speg. Anal. Soc. Ci. Argent. 10: 6. 1880.

ON VERBENACEAE:

Lantana involucrata L., Santiago de las Vegas, June 4, 1916, II, iii, *Johnston 770.*

This long-cycle rust has heretofore been known only from Mexico.

32. NEPHLYCTIS TRANSFORMANS (Ellis & Ev.) Arth. Jour. Myc. 13: 32. 1907.

Puccinia transformans Ellis & Ev. Erythea 5: 6. 1897.

Puccinia exitiosa Syd. & Holw.; Sydow, Monog. Ured. 1: 245. 1902.

ON BIGNONIACEAE:

Stenolobium stans (L.) D. Don (*Tecoma stans* Juss.), Havana, March 24, 1903, *Holway;* Santiago de las Vegas, May 3, 1905, *Horne*, Feb. 28, 1916, II, III, *Johnston 469;* Cojimar (Prov. Habana), May, 1905, *Baker 2605;* Villa Real near Guanabacoa (Prov. Habana), May 20, 1912, *Bro. León 2943;* Cienfuegos (Prov. Santa Clara), Nov. 3, 1915, II, *Johnston 219;* San Antonio de los Baños (Prov. Habana), June 11, 1916, *Johnston 781.*

The species is a short-cycle rust possessing pycnia and telia, as proven by cultures (Arthur, Jour. Myc. **12**: *22.* 1906; **13**: 198. 1907), made in 1905 and 1906. The teliospores for the cultures came from the material sent by Mr. Horne, as listed above. The plants were from seed received from the Bahama islands and sown in the greenhouse the year previous. The greenhouse plants thus infected continued to produce the rust from the same galls for a number of years, under greenhouse conditions. Material fixed from the cultures was utilized by Dr. E. W. Olive in his cytological studies (Sexual cell fusions and vegetative nuclear divisions in the rusts. Ann. Bot. **22**: 331–360. *pl. 22.* 1908). The same author has further studied this material and reported it under the title "The nuclear conditions in certain short-cycled rusts," but only an abstract of the paper (Science II. **33**: 194. 1911) has yet been printed.

The species is known from various parts of Mexico, from New Providence in the Bahama Islands, and from Cuba. *Puccinia elegans* Schröt. of Argentina is a similar short-cycle rust, but with larger and more coarsely sculptured spores, and has not yet been found in North America. Type material for all the names cited has been examined by the senior author. The names and descriptions of the two species involved are unfortunately confused in Sydow's Monographia Uredinearum **1**: 244–245.

33. SPHAEROPHRAGMIUM DALBERGIAE Diet. Hedwigia 32: 30. 1893.

Uredo Sissoo Syd. & Butl. Ann. Myc. 4: 442. 1906.

ON FABACEAE:

Dalbergia Amerimnum Benth., Baracoa (Prov. Oriente), April 14, 1916, II, *Johnston 639*.

The collection shows an abundance of uredinia, but no telia. The characters agree well with the description of the species as given in Sydow, Monog. Ured. 3: 186, but no original specimen has been seen. Although heretofore recognized only from Natal in southern Africa, yet upon comparing the Cuban collection with the one distributed in Sydow, Uredineen *2150*, which was collected by E. J. Butler at Pusa, India, and issued as *Uredo Sissoo*, the agreement seems perfect, and the wide tropical distribution becomes apparent. The description by Dietel in Hedwigia states that the paraphyses are septate, having a cross wall at the middle. That appears to be the case both in the West and East Indian material, but a more critical examination shows that the appearance is due to the arrangement of the cell contents, and not to a cellulose wall. The spores are inclined to be bent to one side, almost kidneyform at times. The two pores of the urediniospores are easily seen.

The *Uredo Dalbergiae* P. Henn., on some species of *Dalbergia* from Brazil, has much smaller, paler and thinner-walled spores. The gross appearance of the sorus is also quite distinct, being smaller and more nearly round.

The reference of this species to the genus *Sphaerophragmium* is based upon the statement by Dietel that he found a single sorus with some half dozen teliospores. The character of the life cycle is problematical.

34. UROMYCES LEPTODERMUS Sydow; Sydow & Butler, Ann. Myc. 4: 430. 1906.

ON POACEAE:

Panicum barbinode Trin., Santiago de Cuba (Prov. Oriente), March 6, 1903, II, *Holway;* Santiago de las Vegas, March 1, 1907, II, III, *Baker* (Barth. Fungi Columb. *2671*), Jan. 29, 1916, II, *Johnston 425;* San Pedro, Isle of Pines, Feb. 12–March 22, 1916, II, *Britton & Wilson 14715*, *Britton*, *Britton & Wilson 15357;* Herradura (Prov. Pinar del Rio), March, 1917, II, *Horne*.

The alternate form and host for this heteroecious species are

yet unknown. The rust occurs on a number of species of *Panicum* and *Lasiacis* in tropical regions from southern Florida and Mexico into South America, and in the West Indies on the islands of Porto Rico and Jamaica as well as Cuba. It occurs also in India.

35. UROMYCES ERAGROSTIDIS Tracy, Jour. Myc. **7**: 281. 1893.
ON POACEAE:
Eragrostis tephrosanthos Schult., Santiago de las Vegas, June 5, 1916, II, *Johnston 755*.

The species has not before been collected in Cuba, and in the West Indies has been reported only from Bayamon and Rio Piedras in Porto Rico. It is not uncommon in the southern United States, Mexico, and Central America on various species of *Eragrostis*. The aecial form and its host are not known.

36. UROMYCES IGNOBILIS (Sydow) Arth. Mycologia **7**: 181. 1915.
Uredo ignobilis Sydow, Ann. Myc. **4**: 444. 1906.
Uromyces major Arth. Bull. Torrey Club **38**: 377. 1911.
ON POACEAE:
Sporobolus indicus (L.) R. Br., Santiago de las Vegas, June 5, 1916, II, *Johnston 754*.

This is the second collection for the West Indies, the other being from Porto Rico, although it is probably a common tropical rust. It is known also from Mexico and India. Aecia are not known, and telia are not common.

Through the kindness of Mrs. Agnes Chase, material has been examined, taken from the phanerogamic collection of the U. S. Department of Agriculture, as follows, all on *S. indicus:* El Cuana, March 24, 1900, II, *404;* Consolación del Sur, April 3, 1900, II, III, *473;* San Diego de los Baños, April 26, 1900, II, *627*, all from Prov. Pinar del Rio, and collected by *Palmer & Riley;* also Isle of Pines, Jan. 31, 1904, II, *A. H. Curtiss 323*.

37. UROMYCES RHYNCOSPORAE Ellis, Jour. Myc. **7**: 274. 1893.
ON CYPERACEAE:
Rynchospora distans (Michx.) Vahl.

The rust was detected on this host in the phanerogamic herbarium at the N. Y. Bot. Garden, on a specimen collected at Pinar del Rio, no date but probably about 1857, *Charles Wright 3399*. This heteroecious rust, whose aecia are unknown, occurs

on many species of *Rynchospora* throughout the eastern United States and the West Indies, the record for the islands being Jamaica, Porto Rico, Martinique, Bermuda, and the Bahamas.

38. UROMYCES SCLERIAE P. Henn. Hedwigia Beibl. **38**: 67. 1899.

ON CYPERACEAE:

Scleria lithosperma (L.) Sw.

This heteroecious species was detected in the phanerogamic herbarium of the N. Y. Bot. Garden, on this host, collected six miles from northwestern end Cayo Coco (Prov. Camagüey), Oct. 23–24, 1909, *J. A. Shafer 2729*, showing both uredinia and telia. Previously it has been known in North America only from Porto Rico. The aecial form is yet to be discovered.

39. UROMYCES COMMELINAE (Speg.) Cooke, Trans. Roy. Soc. Edinb. **31**: 342. 1888.

ON COMMELINACEAE:

Commelina longicaulis Jacq., Cienfuegos (Prov. Santa Clara), Nov. 5, 1915, *Johnston 207*.

This species is imperfectly known. Only uredinia have been found in the western hemisphere, but telia have been collected on the African coast of the Red Sea, the adjacent island of Socotra, and the Malabar coast of India. It is assumed, without direct evidence, that the species also includes pycnia and aecia in its life cycle, but whether it is to be considered as autoecious or heteroecious is highly problematical. In America it is recorded also from Jamiaca, Porto Rico, St. Croix, and South America.

The host is usually given as *C. nudiflora* L., a name, as reported at the New York Botanical Garden, belonging to a very different plant, not a member of the true genus *Commelina*.

40. UROMYCES CELOSIAE Diet. & Holw. Bot. Gaz. **31**: 326. 1901.

ON AMARANTHACEAE:

Iresine Celosia L. (I. *paniculata* Poir.), Santiago de las Vegas, Feb. 28, 1916, II, *Johnston 468*.

This is the first record for the West Indies, although known for Mexico and Guatemala. The species is imperfectly understood. Beside uredinia and telia there is a possibility that pycnia and aecia appear to complete the life cycle, and there is some likelihood of heteroecism.

41. UROMYCES JAMAICENSIS Vesterg. Ark. Bot. Stockh. 4^{15}: 33. 1905.

ON FABACEAE:

Bauhinia divaricata L., Caleta Grande, Isle of Pines, March 9, 1916, *Britton, Wilson & León 15335*.

An autoecious species, apparently short-cycled although no pycnia have yet been detected. It occurs in Mexico on the same host, and in Porto Rico and Jamaica on other hosts.

42. UROMYCES MEDICAGINIS Pass.; Thüm. Herb. Myc. Oecon. *156*. 1874.

Uromyces Medicaginis-falcatae Wint. in Rab. Krypt.-Fl. 1: 159. 1881.

ON FABACEAE:

Medicago sativa L., Santiago de las Vegas, May 13, 1916, II, *Johnston 700*.

The alfalfa rust has not before been reported from Cuba, and only one other West Indian station is known for it, Bermuda. When it does occur the rust appears to attack its host with much virulence, causing the leaves to roll up and shrivel.

The species is considered to be heteroecious, with aecia on upright-growing euphorbias of the genus *Tithymalus*, but no aecia have been found in America, and no cultures have been made with American material.

43. UROMYCES NEUROCARPI Dietel, Hedwigia 34: 292. 1895.

Uromyces insularis Arth. Bull. Torrey Club 33: 515. 1906.

ON FABACEAE:

Clitoria rubiginosa Juss., Baracoa (Prov. Oriente), March, 1903, II, III, *Underwood & Earle 1386*, April 14, 1916, II, *Johnston 615;* Rio de la Casas, Isle of Pines, March 20, 1916, II, III, *Britton & Wilson 15653;* Sabanilla (Prov. Oriente), April 22, 1916, II, *Johnston 631*.

This species was detected also in the phanerogamic herbarium of the N. Y. Bot. Garden on the same host from Tabajó at base of El Yunque, Dec. 12, 1910, *J. A. Shafer 7719*. The species has been taken also in Porto Rico and Jamaica, but outside of the West Indies only in Vera Cruz, Mexico, and Brazil. The species is doubtless autoecious, requiring pycnia and aecia to complete the life cycle, although they have not yet been discovered.

44. UROMYCES APPENDICULATUS (Pers.) Fries, Summa Veg. Scand. 514. 1849.

ON FABACEAE:

Phaseolus vulgaris L., Havana, March 21, 1903, II, iii, *Holway;* Candelaria (Prov. Pinar del Rio), Feb. 17, 1917, II, *Johnston 938.*

Vigna vexillata (L.) A. Rich., Toa, Baracoa (Prov. Oriente), April 17, 1916, II, *Johnston 568.*

The species has been detected also on phanerogamic specimens in the herbarium of the N. Y. Bot. Garden, on *Dolichos Lablab* L. (*Lablab vulgaris* Savi) from Regla (Prov. Habana), April 8, 1903, II, *J. A. Shafer 98;* on *Vigna repens* (L.) Kuntze, Punta de Afuera, Bahia Honda (Prov. Pinar del Rio), Dec. 14, 1910, II, *Percy Wilson 9261; Vigna vexillata* (L.) A. Rich., Campo Florido (Prov. Habana), July 18, 1912, II, *Bro. León 3352.*

The collection on *Vigna vexillata*, made by Mr. Johnston, shows urediniospores with two or three pores, varying from equatorial to markedly superequatorial, a condition also noted in the Porto Rican rusts on this host genus (Mycologia 7: 185. 1915).

The species is autoecious, but pycnia and aecia have not been reported from the tropics, and even telia are somewhat rare. The rust is cosmopolitan on *Dolichos*, *Phaseolus*, *Strophostyles*, *Vigna*, and probably other genera.

45. UROMYCES DOLICHOLI Arth. Bull. Torrey Club 33: 27. 1906.

ON FABACEAE:

Cajan Cajan (L.) Millsp. (*Cajanus indicus* Spreng.), Santiago de las Vegas, Jan. 30, 1916, II, *Johnston 461.*

Although no pycnia or aecia have been found, yet the affinities of this rust lead one to believe that it is autoecious. It ranges from Texas to Colombia and probably to Argentina, the collections usually showing only uredinia. Various notes regarding the species are given in the Uredinales of Porto Rico (Mycologia 7: 186–188. 1915). Other West Indian islands represented are Porto Rico and St. Domingo.

46. UROMYCES HEDYSARI-PANICULATI (Schw.) Farl.; Ellis, N. Am. Fungi *246*. 1879.

Uromyces solidus Berk. & Curt. Grevillea 3: 57. 1874.

Uredo Desmodii-tortuosi P. Henn. Hedwigia 35: 252. 1896.

ON FABACEAE:

Meibomia Scorpiurus (Sw.) Kuntze (*Desmodium Scorpiurus* Desv.), Soledad, Cienfuegos (Prov. Santa Clara), Nov. 5, 1915, II, *Johnston 194;* Matanzas (Prov. Matanzas), Feb. 7, 9, 1916, II, *Britton, Britton & Wilson 14087;* Rio de las Casas, Isle of Pines, March 20, 1916, II, *Britton & Wilson 15652;* Santiago de las Vegas, Jan. 30, 1916, II, *Johnston 460;* Omaja (Prov. Oriente), March 31, 1916, II, *Johnston 599.*

Meibomia tortuosum (Sw.) Kuntze (*Desmodium tortuosum* DC.), Santiago de las Vegas, Feb. 26, 1916, II, *Johnston 149.*

The rust is probably not rare throughout the island in the uredinial stage. It has been detected in the phanerogamic herbarium of the N. Y. Bot. Garden on *Meibomia Scorpiurus*, Rio San Miguel (Prov. Pinar del Rio), Dec. 17, 1910, *Percy Wilson 9380*, and on *M. tortuosum* near Vento (Prov. Habana), Aug. 13, 1907, *Baker, Tracy & Hasselbring 3079*, and near Herradura (Prov. Pinar del Rio), Aug. 28–31, 1910, *Britton & Earle 6591.*

Through the kindness of Dr. Lindau of the Berlin Museum, the senior author has recently been enabled to examine the spores from the collection made by Sintenis in Porto Rico, named by Hennings *Uredo Desmodii-tortuosi*, and finds that they are finely echinulate, and not truly smooth as described by Hennings, and in every way agree with those of the common form.

The species is only known elsewhere in the West Indies from Porto Rico, but has a continental range both north and south. It is autoecious, but pycnia and aecia are rarely seen, the latter being pale and inconspicuous.

47. UROMYCES JANIPHAE (Wint.) Arth. Mycologia 7: 190. 1915.

ON EUPHORBIACEAE:

Manihot Manihot (L.) Cockerell (*M. utilissima* Pohl, *Jatropha Manihot* L.), Santiago de las Vegas, Feb. 4, 1916, II, *Johnston;* same, Oct. 13, 1916, *Johnston 903.*

The material collected by Mr. Johnston affected the fruit with a strong development of uredinia; all other material seen has been on the leaves or stems of the plant.

The species is autoecious, with all spore forms, and is known

from Porto Rico, Mexico, and South America. Aecia and telia have been found only in Mexico.

48. UROMYCES PROËMINENS (DC.) Pass. Rab. Fungi Eur. *1795*. 1873.

Uromyces Euphorbiae Cooke & Peck; Peck, Ann. Rep. N. Y. State Mus. **25**: 90. 1873.

ON EUPHORBIACEAE:

Chamaesyce hirta (L.) Millsp. (*Euphorbia hirta* L., *E. pilulifera* L.), Soledad, Cienfuegos (Prov. Santa Clara), Nov. 4, 1915, II, *Johnston 223;* Herradura (Prov. Pinar del Rio), March, 1917, I, II, *Horne.*

Chamaesyce hypericifolia (L.) Small (*Euphorbia hypericifolia* L.), Madruga (Prov. Habana), Aug. 14, 1916, II, III, *Johnston 871.*

Poinsettia heterophylla (L.) Kl. & Garcke (*Euphorbia heterophylla* L.), Santiago de las Vegas, May 19, 1905, II, *Horne*, Feb. 26, 1916, II, *Johnston 487;* Saetia (Prov. Oriente), April 8, 1916, II, III, *Johnston 546.*

This autoecious species possessing pycnia, aecia, uredinia, and telia is probably rather common throughout the West Indies, as well as northward and southward. It has been reported from Jamaica, Porto Rico, St. Croix, and the Bahamas. The aecia, which are not uncommon, usually occupy the under surface of all the leaves of erect and somewhat drawn and etiolated shoots. The uredinia of Charles Wright's collection no. 720, reported in the Cuban Fungi under the name *Trichobasis euphorbiaecola* B. & C., appear to be on *Chamaesyce hirta*, judging from the hairs and serration of the fragment of leaf seen from the Herb. Curtis, kindly transmitted by Dr. W. G. Farlow.

49. **Uromyces Cupaniae** (Speg.) nom. nov.

Uredo cristata Speg. Anal. Soc. Ci. Argent. **17**: 119. 1884.

ON SAPINDACEAE:

Cupania macrophylla A. Rich., Santiago de las Vegas, June 6, 1905, *Baker 88*, Dec. 3, 1916, *Johnston 927;* San Antonio de las Baños (Prov. Habana), June 11, 1916, *Johnston 779;* Taco Taco (Prov. Pinar del Rio), Sept. 17, 1916, *Johnston 876.*

Pycnia amphigenous, thickly scattered among the telia over dark-colored, hypertrophied and bullate areas 2–8 mm. across, noticeable, subepidermal, dark brown, globoid or flattened-globose in section, 80–130 μ in diameter by 65–125 μ in height; ostiolar filaments compact, 30–40 μ long.

Telia amphigenous, scattered over dark-colored, bullate areas, 2–8 mm. across, strongly punctiform, main part of the sorus very deep-seated within the mesophyll, opening by a pore; paraphyses and peridium none; teliospores obovate or fusiform, 16–29 by 40–58 μ, narrowed below, rounded or somewhat narrowed above; wall colorless or nearly so, the inner portion firm, 1–2 μ thick, the outer portion hygroscopic, swelling to 5–15 μ thick, strongly tuberculate along prominent ridges or wings, especially toward the summit; pedicel completely fugacious.

This rust is most unusual in gross appearance. The swollen areas are prominent, both from the chocolate-brown color and from being well raised above the leaf surface. The teliospores are ejected from the narrow openings of the sori in colorless masses. In vertical section the sori are found to be flask-shaped, with two or more layers of host cells above them, and having the spores developed from a hymenium at the base. The crested appearance of the teliospores is highly distinctive.

The specimens collected by Baker in 1905 were on old and bleached leaves, and had little appearance of a rust. A packet in the Arthur herbarium had been labelled *Gymnosporangium guaraniticum*, a synonym for a Hyphomycetous fungus now called *Patouillardiella guaranitica*. The identity of the fungus was not ascertained, although much study was given to it, until the excellent material from the junior author was available. The characters of the rust were then easily obtained, and soon identified with those of *Uredo cristata* Speg., a species founded on an unidentified species of Sapindaceae, collected by B. Balansa in Paraguay, January, 1882, no. *3474*. A new specific name is now given, as the one applied by Spegazzini is already in use in the genus *Uromyces*.

In his comments Spegazzini calls it "species pulcherrima distinctissima," which it truly is. It is a short-cycled rust, so very distinctive that it is impossible to state its systematic position. Although described as a *Uromyces*, yet it has affinities with both the *Uropyxidatae* and *Phragmidiatae*. There is considerable

similarity to the telia of *Skierka*, and it may represent a correlated short-cycle genus. Until the spores are germinated, it can not be known whether the pores are apical or lateral, a character having considerable importance.

50. UROMYCES HOWEI Peck, Ann. Rep. N. Y. State Mus. 30: 75. 1879.

ON ASCLEPIADACEAE:

Asclepias curassavica L., Santiago de las Vegas, Oct. 24, 1915, II, *Johnston 132;* San Pedro, Isle of Pines, Feb. 12–March 22, 1916, II, III, *Britton & Wilson 14809;* Baracoa (Prov. Oriente), April 15, 1916, II, *Johnston 519.*

Asclepias nivea L., San Antonio de los Baños (Prov. Habana), June 11, 1916, II, *Johnston 778.*

The species is common in temperate regions northward, but rare in the tropics. The only other West Indian island where it has been taken is Porto Rico.

The life cycle is uncertain. Only uredinia and telia are known, and whether the rust possesses both pycnia and aecia, and whether it is autoecious or heteroecious, are yet wholly open questions.

51. UROMYCES GEMMATUS Berk. & Curt.; Berkeley, Jour. Linn. Soc. 10: 357. 1869.

ON CONVOLVULACEAE:

Jacquemontia nodiflora (Desv.) G. Don (*Convolvulus nodiflorus* Desv.), Prov. Oriente, 1856, II, *Charles Wright.*

The species is autoecious, having pycnia, uredinia, and telia, but no aecia. The collection made by Charles Wright, here listed, is in the Curtis collection at Harvard University. It is labelled "*Uredo gemmata* Berk. & Curt. var.," and possesses only uredinia. The type of the species in the Kew herbarium, Wright's no. 278, has not been seen. The species was not again collected until found by F. L. Stevens in a number of localities in Porto Rico, 1913. Specimens, now first reported, were secured by E. W. D. Holway in Porto Rico in 1911, and in Jamaica in 1915. The only other known locality is St. Croix. A full description of the species with notes is given in Mycologia 7: 192–193. 1915.

52. UROMYCES DOLICHOSPORUS Diet. & Holw. Bot. Gaz. 31: 327. 1901.

ON BORAGINACÈAE:

Tournefortia volubilis L., Punta Sabanilla, Cienfuegos Bay (Prov. Santa Clara), Feb. 24, 1910, II, *Britton, Earle & Wilson 4575*.

The species is autoecious, having large subepidermal pycnia, chestnut-brown uredinia, and colorless telia. The fungus distorts and etiolates young and growing organs. It is known elsewhere only from Oaxaca, Mexico.

53. UROMYCES HELLERIANUS Arth. Bull. Torrey Club 31: 2. 1904.

ON CUCURBITACEAE:

Cayaponia racemosa (Sw.) Cogn., Soledad, Cienfuegos (Prov. Santa Clara), Nov. 6, 1915, *Johnston 192*.

Melothria guadalupensis (Spreng.) Cogn., Riverside (Prov. Camagüey), Nov. 30, 1915, *Johnston 285*.

Uredinia and a few telia were detected also on a phanerogamic specimen in the herbarium of the N. Y. Bot. Garden, on *Melothria guadalupensis*, from Buenaventura (Prov. Pinar del Rio), Dec. 13, 1910, *Percy Wilson 9237*. The species occurs in Porto Rico and Guatemala. It is considered autoecious and to have pycnia and aecia, which are yet undetected, however.

54. UROMYCES BIDENTICOLA (P. Henn.) Arth. Mycologia 9: 71. 1917.

Klebahnia Bidentis Arth. Mycologia 7: 196. 1915.

ON CARDUACEAE:

Bidens leucantha Willd., Santiago de las Vegas, March 11, 1916, *Johnston 729;* Baracoa (Prov. Oriente), April 17, 1916, II, III, *Johnston 569;* Holguin (Prov. Oriente), April 4, 1916, II, *Johnston 577;* Paso Estancia (Prov. Oriente), May 3, 1916, II, *Johnston 702;* San Antonio de los Baños (Prov. Habana), June 11, 1916, II, III, *Johnston 765*.

Bidens pilosa L., Havana, Feb. 5, 1916, II, *Britton, Britton & Wilson 14138;* Caleta Cocodrilos, Isle of Pines, March 8, 1916, II, *Britton, Britton & Wilson 15268*.

This autoecious species, having pycnia, uredinia, and telia, is now first reported from Cuba, but has been known from Porto Rico, Jamaica, and Martinique, as well as from the continents of North and South America. It has usually been listed under *U. Bidentis* Lagerh., a name belonging to a similar short-cycle species on the same hosts, not yet reported for Cuba.

55. UROMYCES COLUMBIANUS Mayor, Mém. Soc. Neuch. Sci. Nat. 5: 467. 1913.

Nigredo columbiana Arth. Mycologia 7: 194. 1915.

ON CARDUACEAE:

Melanthera brevifolia O. E. Schultz, Santiago de las Vegas, July 26, 1915, II, III, *Johnston 143*.

Uredinia have been found on phanerogamic specimens in the herbarium of the N. Y. Bot. Garden, on *M. brevifolia*, Vedado (Prov. Habana), May, 1909, *Bro. León 1371*, and on *M. hastata cubensis* O. E. Schultz, near Sta. Fé (Prov. Habana), Oct. 7, 1915, *Bro. León*.

This autoecious rust has heretofore been known only from Porto Rico, and from the type locality in Colombia, S. A. The life cycle embraces pycnia, aecia, uredinia, and telia.

56. PUCCINIA PURPUREA Cooke, Grevillea 5: 15. 1876.

ON POACEAE:

Holcus halepensis L. (*Sorghum halepense* Pers., *Andropogon halepensis* Brot.), Santa Clara (Prov. Santa Clara), March 19, 1903, II, *Holway* (Barth. Fungi Columb. *4670*); Havana, March 21, 1903, II, *Holway* (Barth. N. Am. Ured. *963*) and March 24, 1903, *Holway;* Aguacate (Prov. Habana), March 23, 1903, *Holway;* Santiago de las Vegas, July 19, 1904, *Horne*, and Sept. 27, 1915, *Johnston 169;* Herradura (Prov. Pinar del Rio), March, 1917, II, III, *Horne*.

Holcus Sorghum L. (*Sorghum vulgare* Pers.), Santiago de las Vegas, Nov. 17, 1905 (Broom, Kaffir, and Milo), *Horne*, March 1, 1907, *Baker 1716*, *1717* (Barth. N. Am. Ured. *1072*, Fungi Columb. *2464*, Sydow Ured. *2328*), March 10, 1916 (Egyptian millet), *Johnston 730*.

The species is undoubtedly heteroecious, but the aecial host is yet undiscovered. A very common rust in warm regions, usually

producing both uredinia and telia. The other West Indian islands represented are Jamaica, Porto Rico, and Bermuda.

57. PUCCINIA CENCHRI Diet. & Holw. Bot. Gaz. **24**: 28. 1897.

ON POACEAE:

Cenchrus echinatus L., Santiago de Cuba (Prov. Oriente), March 7, 1903, II, *Holway;* Itabo (Prov. Matanzas), Nov. 12, 1915, II, *Johnston 181;* Baracoa (Prov. Oriente), April 18, 1916, II, *Johnston 664;* Santiago de las Vegas, June 5, 1916, II, III, *Johnston 764.*

Cenchrus viridis Spr., Santiago de las Vegas, Sept. 27, 1915, II, *Johnston 165;* Saetia (Prov. Oriente), April 8, 1916, ii, *Johnston 537.*

A heteroecious species whose alternate host is not known. It occurs in the southern United States, Mexico, Porto Rico, and the Bahamas.

58. PUCCINIA DEFORMATA Berk. & Curt. Jour. Linn. Soc. **10**: 357. 1869.

ON POACEAE:

Olyra latifolia L., without locality, January, 1857, II, III, *Charles Wright 596;* Soledad, Cienfuegos (Prov. Santa Clara), Nov. 7, 1915, II, *Johnston 247;* Ceballos (Prov. Camagüey), March 24, 1916, II, *Johnston 509.*

The type collection was made by Charles Wright in eastern Cuba, January, 1857, locality not given. A number of collections have been made in Porto Rico, and one in Nicaragua. The species is considered autoecious, but no clue to the alternate host has yet been obtained.

59. PUCCINIA HUBERI P. Henn. Hedwigia Beibl. **39**: 76. 1900.

ON POACEAE:

Panicum fasciculatum Sw., Toa, Baracoa (Prov. Oriente), April 17, 1916, II, *Johnston 641.*

Paspalum virgatum L., Ceballos (Prov. Camagüey), Nov. 23, 1915, II, III, *Johnston 307.*

This imperfectly known, heteroecious species has been reported from Porto Rico on *Panicum fasciculatum* and *P. trichoides*, but not from other West Indian islands. It was first described from Brazil.

60. PUCCINIA SUBSTRIATA Ellis & Barth. Erythea 5: 47. 1897.

Puccinia Chaetochloae Arth. Bull. Torrey Club 34: 585. 1907.

ON POACEAE:

Chaetochloa geniculata (Lam.) Millsp. & Chase (*C. imberbis* Scribn., *C. purpurascens* S. & M.), Santiago de las Vegas, Feb. 26, 1916, II, *Johnston 483;* same, June 5, 1916, II, *Johnston 762;* San Pedro, Isle of Pines, Feb. 12 Mar. 22, 1916, II, *Britton & Wilson 15439;* Baracoa (Prov. Oriente), April 17, 1916, II, *Johnston 558.*

Chaetochloa onurus (Willd.) S. & M., Ceballos (Prov. Camagüey), Nov. 25, 1915, II, *Johnston 301.*

Chaetochloa verticillata (L.) Scribn., Botanic Garden, Havana, March 21, 1903, *Holway.*

Syntherisma sanguinalis (L.) Dulac (*Panicum sanguinale* L.), Santiago de las Vegas, Feb. 26, 1916, *Johnston 482.*

This heteroecious species, with the alternate host unknown, is a common cosmopolitan rust occurring on many species of hosts, especially in warmer regions. It ranges from Nebraska southward into South America. Of the other West Indian islands it is known from Jamaica, Porto Rico, and Bermuda.

In addition to the above localities, a number have been found in connection with phanerogamic specimens in the herbarium of the N. Y. Bot. Garden: on *C. geniculata*, Isle of Pines, May, 1910, II, *O. E. Jennings 154;* Los Palacios (Prov. Pinar del Rio), Jan. 15, 1912, II, *J. A. Shafer 11795;* on *C. onurus* (Willd.) S. & M., near the mouth of Bueyvaca (Prov. Matanzas), Aug. 28, 1903, II, *Britton & Wilson 29;* near Santiago, Sept. 6, 1906, II, *Norman Taylor 232;* Sierra Nipe (Prov. Oriente), Dec. 5, 1909, *J. A. Shafer 3020;* on *C. setosa* (Sw.) Scribn. (*Setaria setosa* Beauv.), El Yumuri (Prov. Matanzas), April, 1849, *Rugel 880.*

61. **Puccinia Anthephorae** (Syd.) comb. nov.

Uredo Anthephorae Sydow, Ann. Myc. 1: 22. 1903.

ON POACEAE:

Anthephora hermaphrodita (L.) Kuntze (*A. elegans* Schreb.).

Through the kindness of Dr. H. Sydow, some of the original collection of this species has been examined. It differs from the uredinia of *Puccinia Chaseana* Arth., occurring on the same host, in having thick-walled urediniospores. The collection, as stated

by the Sydows (l.c.), was made in Cuba by Ramon de la Sagra. No date or locality is given.

Telia were found associated with uredinia on a phanerogamic specimen of the same host, at the New York Botanical Garden, collected between Portland Point and Rocky Point, Jamaica, March 5, 1908, *N. L. Britton 1917*. A few teliospores were found on another similar phanerogamic specimen in the same herbarium, collected in St. Croix, Feb. 6, 1896, *Alfred E. Ricksecker 253*. From these two collections the following characters for the telia have been secured.

Telia amphigenous, scattered, linear or oblong, 0.2–2 mm. long, early naked, opening by a longitudinal slit of the epidermis, compact, blackish-brown, ruptured epidermis noticeable; teliospores broadly ellipsoid, 23–26 by 31–35 μ, rounded at both ends, only slightly constricted at septum; wall chestnut-brown, 3–4 μ thick, somewhat thicker above, 5–7 μ, with a broad, low, concolorous umbo, smooth; pedicel hyaline, 9 μ broad, not tapering, up to 85 μ long, the wall thin, 1 μ.

The species is only known from the three collections cited, but is doubtless widespread, although it may not be abundant, throughout the West Indies, as the host is a wayside weed.

62. PUCCINIA RHAMNI (Pers.) Wettst. Verhl. Zool.-Bot. Ges. Wien **35**: 545. 1886.

Puccinia coronata Corda, Icones **1**: 6. 1837.

ON POACEAE:

Avena sativa L., Santiago de las Vegas, March 14, 1917, II, III, *Johnston 937*.

This is the only record of the oat rust for the West Indies. The species is represented in Mexico by two collections on *Bromus* from the federal district made by E. W. D. Holway, and is not reported from Central America.

63. PUCCINIA POCULIFORMIS (Jacq.) Wettst. Verhl. Zool.-Bot. Ges. Wien **35**: 544. 1886.

Puccinia graminis Pers. Neues Mag. Bot. **1**: 119. 1794.

ON POACEAE:

Triticum vulgare Vill. (*T. sativum* Lam.), without locality or date (*Ramon de la Sagra?*).

The only record of the black stem-rust of wheat for any of the West Indian islands is in the Flora Cubana (Montagne, Pl. Cell.

Cuba 293. 1842), where the species is described in full and the statement is made that it occurs on culms, leaves, and glumes, and even awns, of wheat. The record is presumably based on a collection by Ramon de la Sagra.

64. PUCCINIA SORGHI Schw. Trans. Am. Phil. Soc. II. 4: 295. 1832.

ON POACEAE:

Zea Mays L., Santiago de las Vegas, Aug. 26, 1904, *Baker 1265*, Aug. 4, 1905, *Horne*, Oct. 1, 1915, *Johnston 171;* Guanajay (Prov. Pinar del Rio), Jan. 27, 1915, II, *Johnston 142;* Artemisa (Prov. Pinar del Rio), Jan. 29, 1915, II, III, *Johnston 148*.

The rust is heteroecious, with aecia on various species of *Oxalis*. The rust is rarely collected in tropical regions, this being the only record for the West Indies.

65. PUCCINIA CANALICULATA (Schw.) Lagerh. Tromsö Mus. Aarsh. **17**: 51. 1894.

Puccinia Cyperi Arth. Bot. Gaz. **16**: 266. 1891.

ON CYPERACEAE:

Cyperus ferax L. C. Rich., El Yunque, Baracoa (Prov. Oriente), March 10, 1903, II, III, *Holway;* Baracoa (Prov. Oriente), April 15, 1916, II, *Johnston 632*.

Cyperus sp., Herradura (Prov. Pinar del Rio), Jan. 1917, II, III, *Horne*.

A cosmopolitan, heteroecious rust, common on many species of *Cyperus* and *Kyllinga*. It has been proven by cultures to possess aecia on *Xanthium* and *Ambrosia* in the northern United States, but it doubtless has other aecial hosts. Of the other West Indian islands it is known from Jamaica, Porto Rico, and Martinique.

The collection from Herradura has most of the urediniospores with three pores, instead of the usual 2-pored condition with occasionally three pores.

66. PUCCINIA ELEOCHARIDIS Arth. Bull. Iowa State Coll. 156. 1884.

ON CYPERACEAE:

Eleocharis geniculata (L.) R. Br., Baracoa (Prov. Oriente), April 15, 1916, II, *Johnston 501*.

The uredinia were also found on *E. capitata* (L.) R. Br. (*Scirpus capitatus* L.), collected by Charles Wright in Cuba, locality and date not given, the specimen being in the phanerogamic herbarium of Purdue University at Lafayette, Ind., having been received from G. W. Clinton.

The species is heteroecious, it having been shown by culture that the aecia occur on *Eupatorium*. In the tropics the uredinial stage is the one usually collected, and it may be that the rust is there propagated solely by the repeating spores.

Porto Rico is the only other West Indian island from which it is reported.

67. PUCCINIA SCLERIICOLA Arth. Mycologia **7**: 232. 1915.

ON CYPERACEAE:

Scleria verticillata Muhl.

This heteroecious species, whose aecia are unknown, occurs on a number of species of hosts from Florida and Georgia. The record for Cuba is based upon a phanerogamic collection in the herbarium of the N. Y. Bot. Garden, from Nuevo Gerona, Isle of Pines, December, 1903, *A. H. Curtiss*.

68. PUCCINIA FUIRENAE Cooke, Grevillea **6**: 137. 1878.

ON CYPERACEAE:

Fuirena simplex Vahl.

This heteroecious species, whose aecia are unknown, was detected in its uredinial stage on a phanerogamic collection in the National Herbarium and communicated by Mrs. Agnes Chase. It was collected near Nueva Gerona, Isle of Pines, Dec. 17, 1903, by *A. H. Curtiss 237*. The species has been known from South Carolina, Florida, Alabama, and Texas, and is now first reported for the West Indies.

69. PUCCINIA SCIRPI DC. Fl. Fr. **2**: 223. 1805.

Aecidium Nymphoidis DC. Fl. Fr. **2**: 597. 1805.

ON MENYANTHACEAE:

Limnanthemum Grayanum Griseb., Pinar del Rio, December, 1858, O, I, *Charles Wright 929*.

This heteroecious species is represented in America by only two collections. The uredinia were detected in 1902 on *Scirpus lacustris* L. from Guanica, Porto Rico, *A. A. Heller 6291*. The

aecia, as listed above, have been examined in a collection in the herbarium of Dr. W. G. Farlow at Cambridge, Mass., and are characteristic of the species in both gross and microscopic characters. They are accompanied by pycnia. The packet is marked 1857–8, but the year is undoubtedly 1858, as Wright was in Cuba December, 1858, but not there in December, 1857 (cf. Underwood, Wright's explorations in Cuba, Bull. Torrey Club 32: 293. 1905). This is the only collection on this host genus yet made in America.

70. PUCCINIA SMILACIS Schw. Nat. Ges. Leipzig 1: 72. 1822.

ON SMILACEAE:

Smilax havanensis Jacq., San Antonio de los Baños (Prov. Habana), June 11, 1916, II, *Johnston 783*.

A seemingly rare rust in the West Indies, having been collected only once before, in Porto Rico.

71. PUCCINIA CANNAE (Wint.) P. Henn. Hedwigia 41: 105. 1902.

ON CANNACEAE:

Canna indica L., Santiago de las Vegas, July 2, 1906, *Baker* (Barth. Fungi Columb. *2387*, Sydow Ured. *2114*), July 10, 1906, *Cook;* Los Indios, Isle of Pines, Feb. 13, 1916, II, *Britton, Britton & Wilson 15350;* Baracoa (Prov. Oriente), April 18, 1916, II, *Johnston 662*.

Canna sp., Soledad, Cienfuegos (Prov. Santa Clara), Nov. 4, 1915, *Johnston 220*.

Only uredinia and telia are known for the species, and the character of the remaining part of the life cycle can not be predicted. It is also reported from Jamaica and Porto Rico.

72. PUCCINIA POLYGONI-AMPHIBII Pers. Syn. Fung. 227. 1801.

ON POLYGONACEAE:

Persicaria punctata (Ell.) Small (*Polygonum punctatum* Ell., *P. acre* H.B.K.), Paso Estancia (Prov. Oriente), May 2, 1916, II, *Johnston 517;* San Antonio de los Baños (Prov. Habana), June 11, 1916, II, *Johnston 777*.

These collections show an abundance of uredinia, but no telia, being the usual condition on this host. The first record for the West Indies was from Haiti in 1910, and it was lately taken in Porto Rico. It is a common rust in temperate regions both north and south, as well as in the Old World. Cultures have been con-

ducted both in America and Europe, showing the aecia to occur on species of *Geranium*.

73. **Puccinia striolata** (Speg.) comb. nov.

Uredo striolata Speg. An. Soc. Ci. Arg. **9**: 173. 1880.

Puccinia macropoda Speg. An. Soc. Ci. Arg. **10**: 8. 1880.

ON AMARANTHACEAE:

Iresine angustifolia Euphr. (*I. elatior* Rich.), Cacocum (Prov. Oriente), April 6, 1916, II, *Johnston 534*.

Iresine Celosia L. (*I. paniculata* Kuntze), Aguacate (Prov. Habana), March 23, 1903, *Holway*.

This rust is probably autoecious, but the life cycle is not fully known. No pycnia or aecia have yet been found. Only one collection made by Spegazzini in April, 1880, at Chacarita, Argentina, on *Iresine Celosia* L. (*I. celosioides* L.), is so far known bearing telia. All other collections bear only uredinia.

The species has also been reported from the islands of St. Thomas and Porto Rico, and from Ecuador and Argentina.

74. PUCCINIA RIVINAE (Berk. & Curt.) Speg. An. Mus. Buenos Aires **19**: 304. 1909.

Aecidium Rivinae Berk. & Curt. Jour. Lin. Soc. **10**: 358. 1869.

Endophyllum Rivinae Arth. N. Am. Flora **7**: 126. 1907.

Puccinia Raunkiaerii Ferd. & Winge, Bot. Tiddskr. **29**: 8. 1908.

ON PETIVERIACEAE (PHYTOLACCACEAE):

Rivina humilis L., Managua near Havana, June 11, 1906, *Cook;* Sabanilla (Prov. Oriente), April 22, 1916, *Johnston 516*.

Rivina octandra L., San Antonio de los Baños (Prov. Habana), April 5, 1905, *Baker & Van Hermann 4775;* Cacocum (Prov. Oriente), April 6, 1916, *Johnston 515;* Santiago de las Vegas, Feb. 27, 1916, *Johnston 477*, May 28, 1916, I, *Johnston 760*, June 4, 1916, II, *Johnston 771;* Paso Estancia (Prov. Oriente), May 3, 1916, I, *Johnston 689, 705;* Ceballos (Prov. Camagüey), March 24, 1916, I, *Johnston 511;* Antilla (Prov. Oriente), April 8, 1916, II, III, *Johnston 512*.

An autoecious species with all spore forms, occurring also in Porto Rico and St. Thomas. The rust greatly distorts the young shoots, as shown in the cut (p. 97). Germination of the aeciospores

was first undertaken by the junior author in March, 1916, by sowing them on the surface of hardened beef agar in a Petri dish. Spores from the small groups of aecia on the leaves germinated readily over night, producing long hyphal tubes, characteristic of aeciospores. The spores from aecia on the greatly hypertrophied shoots, however, could not be made to germinate. Repeated attempts again in 1917 resulted in the same way. Specimens were sent to Lafayette, Ind., which gave no better results. A collection on hypertrophied shoots, made at Santiago de las Vegas on June 14, 1917, and received in Lafayette one week later and quite dry, was sown on the surface of water. The next day, June 22, long unseptated and unbranched germ tubes appeared sparingly. It is proven, therefore, that the hypertrophied form, long known as *Endophyllum Rivinae*, is an aecial form belonging to *Puccinia Rivinae*.

75. PUCCINIA ZORNIAE (Diet.) McAlpine, Rusts of Australia 172. 1906.

Uredo Zorniae Diet. Hedwigia 38: 257. 1899.

ON FABACEAE:

Zornia diphylla (L.) Pers., Herradura (Prov. Pinar del Rio), Sept. 30, 1904, II, III, *Baker 2143*.

This imperfectly known rust, usually collected in the uredinial form, occurs also in Florida and Mississippi, as well as in Africa and Australia. This is the first record for the West Indies. Heretofore teliospores have been reported from Australia only, but both of the collections here listed show telia interspersed with the uredinia. The telia are small and inconspicuous, and were first found when sectioning to ascertain if pycnia might be present. Some of the sori contained only teliospores, no urediniospores being intermixed. The spores are somewhat more slender than those described by McAlpine, and seemingly paler. They appear to be capable of germination upon maturity.

The rust was detected also by Mr. Percy Wilson in the phanerogamic herbarium of the N. Y. Bot. Garden, on the same host, collected at Pinar del Rio, April 23, 1903, *J. A. Shafer 292*.

76. PUCCINIA INFLATA Arth. Bull. Torrey Club 33: 516. 1906.

ON MALPIGHIACEAE:

Stigmaphyllon periplocifolium (Desf.) Juss., Baracoa (Prov. Oriente), March 13, 1903, II, III, *Holway* (Barth. N. Am.

Ured. *42*); near Cayamas (Prov. Santa Clara), Oct. 13, 1904, II, *Baker 3538*.

Stigmaphyllon Sagraeanum A. Juss. (*S. reticulatum* A. Juss.), Rio San Juan (Prov. Santa Clara), March 24–25, 1910, III, *Britton, Earle & Wilson 5906;* palm barren east of Guanabacoa (Prov. Habana), April 2, 1910, II, III, *Britton, Earle & Wilson 6269* (host no. *6261;* Itabo (Prov. Matanzas), Nov. 12, 1915, II, *Johnston 179;* Cienfuegos (Prov. Santa Clara), Nov. 3, 1915, II, *Johnston 190;* Ceballos (Prov. Camagüey), March 23, 1916, II, III, *Johnston 510;* Las Tunas (Prov. Oriente), March 29, 1916, *Johnston 543;* Santiago de Cuba (Prov. Oriente), April 30, 1916, *Johnston 686*.

The species is autoecious, possessing pycnia, uredinia, and telia. It occurs also in Porto Rico on *S. lingulatum*, from which the type was obtained, but has not before been reported elsewhere.

77. **Puccinia barbatula** sp. nov.

ON MALPIGHIACEAE:

Banisteria laurifolia L., Paso Estancia (Prov. Oriente), May 3, 1916, O, II, III, *Johnston 678*.

Pycnia amphigenous, in small groups on brownish areas 1–3 mm. across, dark brown, noticeable, subepidermal, globoid, 70–125 μ in diameter.

Uredinia hypophyllous, few, circinating about the pycnia, oval or oblong, 0.2–0.8 mm. long, originating deep within the tissues and remaining partly covered by them, dehiscent by slit or pore, somewhat pulverulent, dark cinnamon-brown; urediniospores broadly ellipsoid or obovoid, 25–32 by 39–45 μ; wall dark cinnamon-brown, 2–2.5 μ thick, strongly and very sparsely echinulate, the echinulations colorless, 2–2.5 μ long, the pores 2, equatorial.

Telia hypophyllous, crowded about the uredinia, oval or oblong, 0.3–1 mm. long, long covered by the overarching tissues, whitish or pale brown, inconspicuous; teliospores oblong or clavate-oblong, 18–26 by 35–48 μ, rounded at both ends or slightly narrowed below, somewhat constricted at septum; wall colorless, uniformly 1.5–2.5 μ, smooth; pedicel colorless, very broad, 13–15 μ, half length of spore.

78. PUCCINIA ARECHAVELATAE Speg. An. Soc. Ci. Arg. **12**: 67. 1881.

ON SAPINDACEAE:

Cardiospermum microcarpum H.B.K.

This short-cycle rust, common in tropical America, was detected on a phanerogamic collection in the herbarium of the N. Y. Bot. Garden, obtained along the railroad near Cerro (Prov. Habana), April 13, 1903, *J. A. Shafer 183*.

Other West Indian stations are in Jamaica, Porto Rico, Antigua, and the Bahamas.

79. PUCCINIA GOUANIAE Holw. Ann. Myc. 3: 21. 1905.

ON FRANGULACEAE (RHAMNACEAE):

Gouania lupuloides (L.) Urban (*G. domingensis* L.), Ceballos (Prov. Camagüey), Nov. 25, 1915, II, *Johnston 305*.

Gouania polygama (Jacq.) Urban (*G. tomentosa* Jacq.), without locality (Prov. Oriente), December, 1856, II, *Charles Wright 282;* Gibara (Prov. Oriente), March 15, 1903, II, III, *Holway* (Barth. N. Am. Ured. *544*); San Diego de los Baños (Prov. Pinar del Rio), Feb. 7, 1915, II, *Johnston 176;* Matanzas (Prov. Matanzas), Feb. 17, 1916, II, III, *Britton, Britton & Wilson 13999;* Los Indios, Isle of Pines, Feb. 13, II, *Britton, Britton & Wilson 14242;* San Pedro, Isle of Pines, Feb. 12–March 22, 1916, II, *Britton, Britton & Wilson 15804;* Santiago de las Vegas, Feb. 29, 1916, II, III, *Johnston 470;* Baracoa (Prov. Oriente), April 15, 1916, II, *Johnston 594, 618;* Ceiba Mocha (Prov. Matanzas), July 25, 1916, II, *Johnston 868*.

This autoecious species, having pycnia, uredinia, and telia, is discussed in the Stevens' list of Porto Rican Uredinales (Mycologia 7: 237–238. 1915). The collection by Wright, no. 282, is the second one of the two numbers cited under the original description of *Uromyces gemmatus* B. & C. (Jour. Linn. Soc. 10: 356. 1869), a species said to be on "the underside of leaves of *Convolvulus*, &c." The first number there cited (278) is on a Convolvulaceous host (see 51), and the second number must, therefore, represent the "&c." Wright's collection was ample, and the host was determined from material in the Curtis herbarium by Percy Wilson of the New York Garden, Jan. 13, 1915, as *Gouania polygama*. The authorities of the Kew herbarium kindly sent a fragment of 282 to the senior author, which agrees perfectly with that in the Curtis herbarium.

The species occurs on a phanerogamic specimen of *G. poly-*

gama in the herbarium of the N. Y. Bot. Garden, collected at Herradura, March 17, 1907, II, *F. S. Earle 606* (not "806" as erroneously printed in the Porto Rican list, *l. c.*, p. 237). The species occurs also in Porto Rico and in Panama.

80. **Puccinia invaginata** nom. nov.

Uredo Gouaniae Ellis & Kelsey, Bull. Torrey Club **24**: 209. 1897.

ON FRANGULACEAE (RHAMNACEAE):

Gouania lupuloides (L.) Urban (*G. domingensis* L.), Caleta Cocodrilos, Isle of Pines, March 8, 1916, II, III, *Britton, Wilson & León 15275*.

Uredinia hypophyllous, scattered, early naked, pulverulent, cinnamon-brown; paraphyses peripheral, terete to clavate, somewhat incurved, often from a branching base 9–16 by 29–45 μ, the wall colorless, thin, smooth; urediniospores introverted from the side, and appearing (with pore in optical section) arcuate to obovoid-arcuate, 16–19 by 26–31 μ, or (with pore in surface view) obovoid, 19–23 by 26–31 μ; wall cinnamon-brown, 1.5–2 μ thick, sparingly to moderately echinulate, only one pore, equatorial, on indented or flattened side.

Telia amphigenous, scattered, early naked, pulverulent, dark chocolate to blackish-brown, ruptured epidermis inconspicuous; teliospores broadly ellipsoid or broadly obovoid, 26–29 by 29–37 μ, rounded at both ends, slightly or not constricted at septum; wall dark chestnut-brown, uniformly 3–4 μ thick, moderately verrucose; pedicel colorless, 19–50 μ long, fragile.

This is the first collection of the species for Cuba and the first collection showing telia from any locality. The first uredinial collection was made on the island of St. Croix by Ricksecker in 1896 on the same host, and numerous collections have been made in Porto Rico on this host and on *G. polygama*.

81. PUCCINIA HETEROSPORA Berk. & Curt. Jour. Linn. Soc. **10**: 356. 1869.

ON MALVACEAE:

Anoda hastata Cav., Santiago de las Vegas, July 13, 1904, *Earle 235*, July 15, 1904, *Horne*, April 25, 1906, *Baker* (Barth. Fungi Columb. *2358*); Soledad Cienfuegos (Prov. Santa Clara), Nov. 5, 1915, *Johnston 197;* Ceiba Mocha (Prov. Matanzas), July 25, 1916, *Johnston 867*.

Abutilon hirtum (Lam.) Sweet, Herradura (Prov. Pinar del

Rio), Sept. 28, 1906, *Van Hermann 2991* (host no. *2996*) (Barth. Fungi Columb. *2453*); Guanajay (Prov. Pinar del Rio), Sept. 13, 1904, *Earle & Wilson 1508;* Vedado (Prov. Habana), Dec. 6, 1916, *Johnston 925*.

Abutilon indicum Sweet, Botanic Garden, Havana, March 21, 1903, *Holway* (Barth. N. Am. Ured. *240*).

Abutilon permolle (Willd.) Sweet, Gibara (Prov. Oriente), March 15, 1903, *Holway* (Barth. N. Am. Ured. *39*).

Gaya occidentalis (L.) Sweet, Santiago de las Vegas, Sept. 19, 1915, *Johnston 162*, June 25, 1916, *Johnston 851;* Tetas de Camarioca (Prov. Matanzas), Feb. 7, 9, 1916, *Britton, Britton & Wilson 14088*.

Sida glutinosa Cav., Santiago de las Vegas, Nov. 20, 1905, *Van Hermann 3373*.

Sida spinosa L. (*S. angustifolia* Lam.), Santiago de las Vegas, June 25, 1916, *Johnston 854*.

Wissadula periplocifolia (L.) Presl, Manacas (Prov. Santa Clara), Nov. 11, 1915, *Johnston 185;* Camagüey (Prov. Camagüey), Nov. 28, 1915, *Johnston 366*.

A short-cycle species without pycnia, very common throughout the warmer regions of the earth, on many malvaceous genera.

It has been seen on the following collections from Cuba in the phanerogamic herbarium of the N. Y. Bot. Garden: on *Abutilon abutiloides* (Jacq.) Garcke (*A. lignosum* Rich.), Santiago de Cuba, 1899, *V. Havard 78*, March 10-25, 1912, *Britton, Britton & Cowell 12591;* on *Abutilon hirtum* (Lam.) Sweet, Cienfuegos, Aug. 13, 1895, *Robert Combs 462;* Valley of the San Juan (Prov. Pinar del Rio), March 19, 1903, *Britton, Britton & Shafer 277;* on *Anoda hastata* Cav., Matanzas, March 16, 1903, *Britton, Britton & Shafer;* near San Luis (Prov. Oriente), Feb. 15, 17, 18, 1902, *Pollard & Palmer 293;* on *Sida procumbens* Sw., Rio Almendares to Playa de Marianao (Prov. Habana), Dec. 22-23, 1910, *Percy Wilson 9506*.

Other West Indian islands known for the species are Jamaica, Porto Rico, St. Thomas, St. Croix, and the Bahamas, but it probably occurs on many others.

82. PUCCINIA MALVACEARUM Mont. in Gay, Hist. Chile **8**: 43. 1852.

ON MALVACEAE:

Malvastrum coromandelianum (L.) Garcke, Santiago de las Vegas, May 10, 1906, *Cook*.

This widely distributed short-cycle rust, which does not produce pycnia, is here first reported for the West Indies. It was collected on the same host in Venezuela, July 15, 1913, *F. L. Stevens 2861, 2983*. It was found in Jamaica at Mandeville, on *M. corchorifolium* (Desv.) Britton, Oct., 1892, *T. D. A. Cockerell 44*, and again at the same place, Feb. 23, 1915, *E. W. D. Holway 228*.

83. PUCCINIA LUDWIGIAE (E. & E.) Holw. N. Am. Ured. **1**: 72. 1907.

ON ONAGRACEAE:

Isnardia repens (Sw.) DC., Jucaro, Isle of Pines, Feb. 20, 1916, I, *Britton, Britton & Wilson 14624*.

This is the first record for this long-cycle species outside of the United States. The host is also a new one.

84. PUCCINIA PSIDII Wint. Hedwigia **23**: 177. 1884.

ON MYRTACEAE:

Jambos Jambos (L.) Lyons (*Eugenia Jambos* L., *Jambosa vulgaris* DC.), El Yunque, Baracoa (Prov. Oriente), March 10, 1903, II, III, *Underwood & Earle 1381;* same, II, III, *Holway;* Baracoa (Prov. Oriente), April 14, 1916, *Johnston 506;* Candelaria (Prov. Pinar del Rio), Jan. 1917, II, *Horne*.

The synonymy and various notes are given in the Stevens' list of Uredinales of Porto Rico (Mycologia **7**: 239–240. 1915). The full life history of the rust is unknown. Uredinia are common and often accompanied by telia. Quite likely only pycnia are needed to complete the stages.

85. PUCCINIA HYDROCOTYLES (Link) Cooke, Grevillea **9**: 14. 1880.

ON AMMIACEAE (UMBELLIFERAE):

Hydrocotyle australis Coult. & Rose.

This imperfectly known rust is doubtless autoecious. Aecia

have sometimes been referred to it, but they should more likely be associated with *Uromyces Scirpi* (Cast.) Burr. There are a number of reasons for thinking that the present species possesses only pycnia, uredinia, and telia.

The record for Cuba is based upon a phanerogamic collection in the herbarium of the N. Y. Bot. Garden from Guanabaco (Prov. Habana), April 2, 1910, II, *Britton, Earle & Wilson 6249*. No other West Indian station was known, until the 1916 collections by Whetzel and Olive in Porto Rico, although the rust is common along the eastern coast of both North and South America, notably in Central America.

86. **Puccinia Johnstonii** Arthur sp. nov.

ON SAPOTACEAE:

Dipholis salicifolia (L.) A. DC., San Diego de los Baños (Prov. Pinar del Rio), Feb. 7, 1915, II, III, *Johnston 177* (type).

Sideroxylon foetidissimum L., Santiago de las Vegas, Feb. 27, 1916, II, III, *Johnston 489*.

Uredinia hypophyllous, scattered, pustular, small, 0.2–0.3 mm. across, subepidermal, tardily naked, at first opening by a pore, becoming pulverulent, cinnamon-brown, the overarching epidermis quite persistent; paraphyses peripheral in a single row, erect, arising from a short membranous base, 2 or 3 cells deep, terete, colorless, 10–13 μ broad by 37–77 μ long, the inner wall thin, about 1 μ, the outer wall thicker, 3–7 μ; urediniospores ellipsoid or broadly obovate, 23–29 by 37–48 μ; wall cinnamon-brown, 1.5–2 μ thick, thicker above, 5–9 μ, with a lighter umbo, sparsely and strongly echinulate, the pores 4, sometimes 3, equatorial.

Teliospores in uredinial sori ellipsoid or oblong, 23–30 by 33–40 μ, rounded at both ends, not constricted at septum; wall dark chestnut-brown, uniformly 3 μ thick, sparsely and coarsely echinulate, the points 1–2 μ long; pedicel colorless, rough, 10 by 16–23 μ, the upper part swelling in water up to 16 μ, often attached somewhat obliquely.

An interesting species, showing some resemblances to *Prospodium* in the character of wall and sculpturing of the teliospores, Truly echinulate teliospores are a novelty among Uredinales. The circle of short and erect paraphyses, having a tissue-like base of somewhat elongated cells, is clearly a transitional structure between a simple ring of paraphyses and a membranous peridium having ostiolar cells larger than the others.

In naming this distinctive species the senior author takes it upon himself to use the name of Mr. J. R. Johnston in recognition of the important service he has rendered mycology in making known the rust flora of Cuba. It was at his suggestion that this summary of present knowledge was undertaken, the first attempt made to give a full list of Cuban rusts. And it has been through his untiring efforts in securing material and making observations that this considerable showing is possible. More than one third of the number (40 species) is based entirely upon material supplied by Mr. Johnston, and nearly two thirds of the total number of collections are by him. In addition to this, and even more important, he has made many observations which have added to our knowledge of life histories of different species.

87. PUCCINIA CONCRESCENS Ellis & Ev.; Arthur, Mycologia 7: 240. 1915.

Puccinia compacta Kunze; Bubak, Hedwigia Beibl. **42**: 30. 1903. Not Berk. 1855, de Bary 1858, or Thüm. 1875.

ON ASCLEPIADACEAE:

Asclepias curassavica L.

This rather common rust of tropical America has not yet been secured in Cuba by a mycological collector, but occurs on a specimen in the phanerogamic herbarium of the N. Y. Bot. Garden, collected at Baracoa, Jan. 24–29, 1902, *Pollard, Palmer & Palmer 11.*

The species is short-cycled and a lepto-form. The history of the name is reviewed in the Stevens list of Uredinales of Porto Rico (Mycologia **7**: 240–242. 1915), where a description is given.

88. PUCCINIA GONOLOBI Rav.; Berk. Grevillea **3**: 54. 1874.

ON ASCLEPIADACEAE:

Philibertella clausa (Jacq.) Vail, Rio Gavelan (Prov. Santa Clara), March 26, 1910, *Britton, Earle & Wilson 6022;* Baracoa (Prov. Oriente), April 14, 1916, *Johnston 553;* Toa (Prov. Oriente), April 18, 1916, *Johnston 552.*

The asclepiadaceous forms of rust intended to be covered by this name include those with dark sori and ellipsoid teliospores having the septum generally transverse. The species is not well defined. It is a short-cycled lepto-form, without pycnia.

89. PUCCINIA OBLIQUA Berk. & Curt. Jour. Linn. Soc. 10: 356. 1858.

Puccinia Cynanchi Lagerh. Bol. Soc. Brot. 7: 129. 1889.

Puccinia sphaerospora Syd. & Henn. Ann. Myc. 1: 327. 1903.

ON ASCLEPIADACEAE:

Fischeria crispiflora (Sw.) Schl., near Los Indios, Isle of Pines, May 20, 1910, *O. E. Jennings 439* (host no. *438*); Santa Barbara, Isle of Pines, Feb. 23, 1916, *Britton, Britton & Wilson 14784;* Santa Fé, Isle of Pines, Feb. 27, March 1, 1916, *Britton, Britton & Wilson 15108;* Saetia (Prov. Oriente), April 9, 1916, *Johnston 551.*

[*Metastelma penicillatum* Griseb.?] without locality (Prov. Oriente), 1857, *Charles Wright.*

The species is autoecious, and similar in habit and gross appearance to *Puccinia Gonolobi* Rav., but as here used is intended to include those forms having mostly globoid teliospores, with moderately thick walls, and oblique septa in most instances. The type of the species was collected in Cuba by Charles Wright on some undetermined host, locality not given. Upon request the material at the Kew herbarium was examined, and the opinion given that the host appears to be a species of *Metastelma*, probably *M. penicillatum* Griseb. There are, however, at least two collections at Kew. The type cited in the Fungi Cubenses (page 356) is no. 281. This may be the one which is thought to be on *Metastelma penicillatum*, and is listed above. Another collection bears the number 288, but is without year or locality other than "Cuba." A leaf from this collection, kindly sent to the senior author from Kew, well answers to the statement with the original description as a leaf "of some plant resembling chickweed."

90. PUCCINIA CRASSIPES Berk. & Curt. Grevillea 3: 54. 1874.

ON CONVOLVULACEAE:

Ipomoea cathartica Poir. (*I. acuminata* R. & S., not Ruiz & Pav.), Santiago de las Vegas, Aug. 20, 1904, I, *Earle & Wilson 1140* (Barth. Fungi Columb. *2456*), Sept. 3, 1904, I, *Abarca 1361*, Nov. 20, 1904, I, III, *Earle 5190.*

Ipomoea triloba L., Santiago de las Vegas, Nov. 25, 1916, I, *Johnston 923*, Nov. 29, 1917, III, *Johnston 952.*

An autoecious species with aecia and telia, but having no

uredinia. It flourishes especially in warm regions, and has been reported from St. Croix and Porto Rico, and also from the adjoining continent of North America.

91. **Puccinia megalospora** (Orton) comb. nov.

Allodus megalospora Orton, Mem. N. Y. Bot. Gard. **6**: 198. 1916.

ON CONVOLVULACEAE:

Ipomoea carolina L., Hanabanilla Falls, Trinidad Mts. (Prov. Santa Clara), March 1–2, 1910, I, *Britton, Earle & Wilson 4827;* Santa Barbara, Isle of Pines, Feb. 12–March 22, 1916, I, *Britton, Britton & Wilson 14786.*

This autoecious rust resembles *Puccinia crassipes* in the absence of uredinia, and also in gross appearance, but possesses much larger aeciospores, and teliospores more thickened at the apex. The Cuban stations are the only ones known for it outside of Mexico.

92. PUCCINIA LANTANAE Farl. Proc. Amer. Acad. Sci. **18**: 83. 1883.

ON VERBENACEAE:

Lantana Camara L., Holguin (Prov. Oriente), March 17, 1903, *Holway* (Barth. N. Am. Ured. *645*).

Lantana involucrata L. (*L. odorata* L.), hills near Santiago de las Vegas, May 14, 1903, *Baker 2869;* Playa Marianao (Prov. Habana), Oct. 31, 1915, *Johnston 240;* Vanadero (Prov. Matanzas), Feb. 8, 1916, *Britton & Wilson 14049;* Saetia (Prov. Oriente), April 8, 1916, *Johnston 557.*

Lantana reticulata Pers., Marianao (Prov. Habana), Aug. 13, 1916, *Johnston 870.*

Lippia dulcis Trev., Paso Estancia (Prov. Oriente), March 3, 1916, *Johnston 680*, May 3, 1916, *Johnston 703.*

Lippia stoechadifolia H.B.K., San Luis (Prov. Oriente), February, 1902, *Pollard & Palmer 308;* Santiago de Cuba (Prov. Oriente), March 6, 1903, *Holway* (Barth. N. Am. Ured. *749*).

Priva lappulacea (L.) Pers., El Yunque, Baracoa (Prov. Oriente), March 10, 1903, *Holway.*

This short-cycle species, common on many hosts in tropical America, has been detected also on *Lantana trifolia* L. in the

phanerogamic herbarium of the N. Y. Bot. Garden, Santiago de Cuba (Prov. Oriente), April 26, 1902, *S. H. Hamilton 46*, and in the same herbarium on *L. reticulata* Pers., El Moro to Cojimar (Prov. Habana), Dec. 8, 1910, *P. Wilson 9134;* San Juan, Isle of Pines, March 15, 17, 1916, *Britton, Britton & Wilson 14981*.

It has also been taken in Jamaica, Porto Rico, St. Thomas and the Bahamas.

93. PUCCINIA URBANIANA P. Henn. Hedwigia **37**: 278. 1898.

ON VERBENACEAE:

Valerianodes jamaicensis (L.) Medic. (*Abena jamaicensis* Hitch., *Stachytarpheta jamaicensis* Vahl), Santiago de Cuba (Prov. Oriente), March 6, 1903, *Holway;* Batabano (Prov. Habana), March 20, 1906, *Baker 2767;* Consolación del Sur (Prov. Pinar del Rio), Feb. 2, 1915, *Johnston 152;* Santiago de las Vegas, Oct. 2, 1915, *Johnston 154;* Baracoa (Prov. Oriente), April 14, 1916, *Johnston 606*.

A short-cycle species occurring also in Porto Rico and the Bahamas, as well as in southern Florida.

94. PUCCINIA SALVIICOLA Diet. & Holw. Bot. Gaz. **24**: 33. 1897.

ON LAMIACEAE (LABIATAE):

Salvia occidentalis Sw., Marianao (Prov. Habana), Feb. 6, 1916, *Johnston 442;* San Pedro, Isle of Pines, Feb. 12–March 22, 1916, II, *Britton & Wilson 14207o;* Ceballos (Prov. Camagüey), March 24, 1916, II, *Johnston 524;* Sabanilla (Prov. Oriente), April 22, 1916, II, *Johnston 593*.

Only uredinia were found, and these not abundant. The species also occurs in Porto Rico and Jamaica. The full life cycle is unknown, but probably pycnia and aecia are sometimes formed.

95. PUCCINIA MEDELLINENSIS Mayor, Mém. Soc. Neuch. Sci. Nat. **5**: 497. 1913.

ON LAMIACEAE (LABIATAE):

Mesosphaerum pectinatum (Poir.) Kuntze (*Hyptis pectinata* Poir.), Cienfuegos (Prov. Santa Clara), Nov. 3, 1915, *Johnston 196;* Matanzas (Prov. Matanzas), Feb. 7, 1916, II, *Britton, Britton & Wilson 13995*.

Mesosphaerum suaveolens (L.) Kuntze (*Hyptis suaveolens* Poir.), Santiago de Cuba (Prov. Oriente), March 6, 1903,

II, *Holway;* Marianao (Prov. Habana), Oct. 31, 1915, *Johnston 241;* Cienfuegos (Prov. Santa Clara), Nov. 3, 1915, II, *Johnston 244;* Tetas de Camarioca (Prov. Matanzas), Feb. 7, 9, 1916, II, *Britton, Britton & Wilson 14089*; San Juan, Isle of Pines, March 15, 17, 1916, II, *Britton, Britton & Wilson 15461.*

Apparently a common autoecious species throughout the West Indian islands, but on *M. suaveolens* only uredinia have been found. In the North American Flora (7: 212–213. 1912) this species is confused with *Eriosporangium tucumanense* (Speg.) Arth., a South American species not yet found in North America. The description following that name applies to *P. medellinensis*, but should give the pores of the urediniospores as *2 or sometimes 3*.

96. PUCCINIA HYPTIDIS (M. A. Curt.) Tracy & Earle, Bull. Miss. Exp. Sta. 34: 86. 1895.

ON LAMIACEAE (LABIATAE):

Mesosphaerum capitatum (L.) Kuntze (*Hyptis capitata* Jacq.), Baracoa (Prov. Oriente), March 9, 1903, II, *Holway;* Paso Estancia (Prov. Oriente), May 3, 1916, II, *Johnston 695.*

This autoecious species has not yet been taken in the West Indies in any but the uredinial stage, although known from the southern United States on *M. rugosum* (*Hyptis radiata*) bearing pycnia, aecia, and telia, as well as uredinia. The other West Indian stations are in Jamaica and Porto Rico. The record of *Hyptis suaveolens*, as a host under this species in the North American Flora (7: 212), is an error. It belongs under *P. medellinensis*, as given above.

97. PUCCINIA INSITITIA Arth. Mycologia 7: 248. 1915.

ON LAMIACEAE (LABIATAE):

Mesosphaerum lantanifolium (Poir.) Kuntze (*Hyptis lantanifolia* Poir.), Santa Ana, Isle of Pines, March 20, 1916, II, *Britton & Wilson 15668.*

This long-cycle species is founded on a collection from Brazil, and has also been found in Porto Rico. Only uredinia and telia are known.

98. PUCCINIA LEONOTIDIS (P. Henn.) Arth. Mycologia 7: 245. 1915.

ON LAMIACEAE (LABIATAE):

Leonotis nepetaefolia (L.) Br., Botanic Garden, Havana, March 21, 1903, II, *Holway* (Barth. N. Am. Ured. *781*); Vedado (Prov. Habana), Nov. 23, 1916, II, *Johnston 922*.

This autoecious species, occurring throughout the warmer regions of the world, has been found in America only in the uredinial stage. Aecia and telia have been seen from Africa. The other West Indian islands represented are Jamaica, Porto Rico, and the Bahamas.

99. PUCCINIA GLOBOSIPES Peck, Bull. Torrey Club 12: 34. 1885.

ON SOLANACEAE:

Lycium carolinianum Walt., Rio Gavelan (Prov. Santa Clara), March 26, 1910, II, *Britton, Earle & Wilson 6028* (host no. *6027*).

An autoecious species with pycnia, uredinia, and telia, now first reported for the West Indies. It is elsewhere known from Alabama, Kansas, and Utah to the Mexican boundary, and as far west as southern California.

100. **Puccinia Adenocalymnatis** (P. Henn.) comb. nov.

Uredo Adenocalymnatis P. Henn. Hedwigia 35: 249. 1896.

Puccinia aequinoctialis Holw. Ann. Myc. 3: 22. 1905.

ON BIGNONIACEAE:

Cydista aequinoctialis (L.) Miers (*Bignonia aequinoctialis* L.), Baracoa (Prov. Oriente), March 13, 1903, II, III, *Holway* (Barth. N. Am. Ured. *525*).

An imperfectly understood species. Only three collections are known, two being from the West Indies, and on the same host. The collection here cited shows a few teliospores and a good development of uredinia, and a collection from Porto Rico shows uredinia only. The beginning stage of the life cycle has not yet been discovered. A collection from Brazil on *Adenocalymna*, *E. Ule 902*, shows uredinia that appear to be the same as those of the West Indian form. The spores on the fragmentary part of the specimen examined are a trifle smaller, but the measurements given by Hennings are the same as those taken from the West Indian material. As *Adenocalymna* is closely related to *Cydista*,

there appears no good reason for doubting the identity of the two rusts, and they are therefore here united under one name. These rusts were inadvertently placed by the senior author (Mycol. 9: 83. 1917) under *Puccinia cuticulosa* Arth. (*Uredo cuticulosa* E. & E.), a Nicaraguan rust, recently found to be identical with *Prospodium appendiculatum* (Wint.) Arth.

101. PUCCINIA RUELLIAE (Berk. & Br.) Lagerh. Tromsö Mus. Aarsh. 17: 71. 1895.

ON ACANTHACEAE:

Blechum Brownei (Sw.) Juss., Santiago de las Vegas, Feb. 10, 1916, II, III, *Johnston 445*.

This species possesses all spore forms. It occurs also in Porto Rico, Martinique, and in Central and South America on the same host. Only uredinia have been seen on North American collections on this host until the present collection came to hand, which gave a few telia. It is now evident that the rust, heretofore listed as *P. Blechi* Lagerh., is identical with that on *Ruellia*, and other hosts, often listed under the name *P. lateripes* Berk. & Rav.

102. PUCCINIA LATERITIA Berk. & Curt. Jour. Acad. Sci. Phila. 2: 281. 1853.

ON RUBIACEAE:

Borreria laevis (Lam.) Griseb., Baracoa (Prov. Oriente), April 15, 1916, *Johnston 503*.

Hemidiodia ocimifolia (Willd.) K. Schum., El Yunque, Baracoa (Prov. Oriente), March 10, 1903, *Holway*.

The species is a short-cycle form without pycnia. It is a common rust of warm regions, and is known from other West Indian islands on the genera *Diodia*, *Ernodia*, *Mitracarpum*, and *Spermacoce*. It has been reported from Jamaica, Porto Rico, and the Bahamas.

103. PUCCINIA XANTHII Schw. Schr. Nat. Ges. Leipzig 1: 73. 1822.

ON AMBROSIACEAE:

Xanthium longirostre Wallr., Santiago de las Vegas, June, 1905, *Horne;* July 21, 1915, *P. Cardin* (*Johnston 168*), Oct. 1916, *Johnston 3, 4, 5, 13, 15, 16, 17;* Baracoa (Prov. Oriente), April 15, 1916, *Johnston 595*.

Xanthium saccharatum Wallr., Santiago de las Vegas, Oct. 1916, *Johnston 2, 6, 9, 10, 12, 14.*

Xanthium intermediate between *X. longirostre* and *X. saccharatum*, Santiago de las Vegas, Oct. 1916, *Johnston 1, 8, 11.*

The species has been detected on the first host also on a phanerogamic specimen in the herbarium of the N. Y. Bot. Garden, collected at Paso Estancia (Prov. Oriente), Aug. 30, 1909, *J. A. Shafer 1672.*

The species, which is short-cycled and without pycnia, is a common American rust, but rather rare in the West Indian islands, the other stations being in Jamaica, Porto Rico, and Bermuda, and in each instance on *X. longirostre.*

104. **Puccinia fuscella** sp. nov.

ON CARDUACEAE:

Vernonia menthaefolia Less., El Yunque, Baracoa (Prov. Oriente), March 10, 1903, II, III, *Holway* (type), April 18, 1916, II, III, *Johnston 584.*

Uredinia hypophyllous, scattered, roundish, punctiform, minute, 0.1–0.2 mm. across, early naked, pulverulent, light cinnamon-brown, ruptured epidermis noticeable; urediniospores broadly ellipsoid or obovoid, 23–29 by 26–32 μ; wall light cinnamon-brown, moderately thick, 2–3 μ, echinulate, the pores indistinct, probably 4–6, and scattered.

Telia hypophyllous, scattered, or crowded in groups of two or three sori, irregularly roundish, small, 0.2–0.3 mm. across, rather early naked, dark chestnut-brown, ruptured epidermis inconspicuous; paraphyses peripheral, hyphoid, colorless, thin-walled, short and inconspicuous; teliospores oblong, 21–27 by 40–48 μ, slightly constricted at septum, rounded or obtuse at both ends; wall cinnamon-brown, 1.5–2 μ, thicker above, 5–9 μ including a semihyaline umbo, minutely verrucose above, appearing smooth; pedicel colorless, two thirds length of spore or less, fragile.

Closely related to *Puccinia Vernoniae* Schw., but differs in the uredinial pore-arrangement and other minute characters. The type collection was issued as no. *772* in Bartholomew's North American Uredinales, under the name *P. Vernoniae.*

105. PUCCINIA EVADENS Harkn. Bull. Calif. Acad. Sci. 1: 34. 1884.

Eriosporangium evadens Arth. Résult. Sci. Congr. Bot. Vienne 343. 1906.

ON CARDUACEAE:

Baccharis sp., Santa Clara (Prov. Santa Clara), March 22, 1903, II, III, *Holway.*

The species is autoecious, pycnia, aecia, uredinia, and telia all being known, and is found in southern California and Arizona to Central Mexico. The collection here listed is the only one known from the West Indies.

106. PUCCINIA ABRUPTA Diet. & Holw. Hedwigia **37**: 208. 1898.

ON CARDUACEAE:

Viguiera helianthoides H.B.K., Santiago de las Vegas, Feb. 28, 1906, III, *Baker 2682;* Marianao (Prov. Habana), Aug. 13, 1916, II, *Johnston 869.*

The species is probably autoecious, although no pycnia or aecia have yet been seen. The collection by Baker is unique in producing a fusiform swelling of the stem full two inches long and twice the normal diameter of the stem. The uredinia have been rarely seen. It was detected in the phanerogamic herbarium of the N. Y. Bot. Garden, on the same host from Sierra de Anafe (Prov. Pinar del Rio), Dec. 1911, II, *P. Wilson.* The species is now first reported for the West Indies.

107. PUCCINIA HELIANTHI Schw. Schrift. Nat. Ges. Leipzig **1**: 68. 1822.

ON CARDUACEAE:

Helianthus annuus L., Santiago de las Vegas, June 15, 1905, II, *Horne.*

The collection of this autoecious rust, the only one seen from the West Indies, was obtained in the garden of the Cuban Experiment Station. It shows an abundance of sori, but only uredinia. The species is cosmopolitan, and produces pycnia, aecia, uredinia, and telia in the life cycle.

108. PUCCINIA CONOCLINII Seym. Bot. Gaz. **9**: 191. 1884.

ON CARDUACEAE:

Ageratum maritimum H.B.K., Caleta Cocodrilos, Isle of Pines, March 8, 1916, II, III, *Britton, Wilson & León 15311.*

Eupatorium villosum Sw., Gibara (Prov. Oriente), March 15, 1903, II, *Holway;* Santiago de las Vegas, April 5,

1906, II, *Horne*, Feb. 28, 1916, II, *S. C. Bruner* (*Johnston 476*).

This autoecious rust occurs on many hosts in the warmer parts of America. Its aecia are not known, although *Aecidium roseum* Diet. & Holw. was for a time supposed to belong with it, and it has often been listed as *P. rosea*. A collection from Cuba was found in the phanerogamic herbarium of the N. Y. Bot. Garden, from Cabañas Bay (Prov. Oriente), on *E. villosum*, March 17–20, 1912, II, *Britton & Cowell 12816*. Porto Rico is the only other West Indian island at present represented.

109. PUCCINIA SYNEDRELLAE P. Henn. Hedwigia **37**: 277. 1898.

Puccinia solida Berk. & Curt. Jour. Linn. Soc. **10**: 356. 1869. Not *P. solida* Schw. 1832.

Puccinia Tridacis Arth. Bull. Torrey Club **33**: 156. 1906.

Puccinia Eleutherantherae Diet. Ann. Myc. **7**: 354. 1909.

ON CARDUACEAE:

Eleutheranthera ruderalis (Sw.) Sch. Bip., without locality (Prov. Oriente), 1856–7, *Charles Wright 276;* Vivijagua, Isle of Pines, Feb. 28, 29, 1916, *Britton, Britton & Wilson 15071*, March 18, 20, 1916, *Britton & Wilson 15608;* Maravi, Baracoa (Prov. Oriente), April 18, 1916, *Johnston 604*.

Emilia sonchifolia (L.) DC., Ceballos (Prov. Camagüey), Nov. 24, 1915, *Johnston 304;* Canet (Prov. Camagüey), Dec. 1, 1915, *Johnston 280;* Nuevitas (Prov. Camagüey), Dec. 3, 1915, *Johnston 383;* San Pedro, Isle of Pines, Feb. 12–March 22, 1916, *Britton & Wilson 14465;* Columbia, Isle of Pines, March 19, 21, 1916, *Britton, Britton & Wilson 15793;* Paso Estancia (Prov. Oriente), May 3, 1916, *Johnston 704;* Baracoa (Prov. Oriente), April 15, 1916, *Johnston 585*, April 17, 1916, *Johnston 566, 628*.

Neurolaena lobata (L.) R. Br., El Yunque, Baracoa (Prov. Oriente), March 12, 1903, *Holway;* Jucaro, Isle of Pines, Feb. 20, 1916, *Britton, Britton & Wilson 14613*.

Synedrella nodiflora (L.) Gaertn., Cojimar (Prov. Habana), Aug. 24, 1910, *Britton, Earle & Gager 6272* (host no. *6271*); Santiago de las Vegas, Oct. 2, 1915, *Johnston 155;* Taco Taco (Prov. Pinar del Rio), Sept. 17, 1916, *Johnston 877*.

Tridax procumbens L., Punta Brava (Prov. Pinar del Rio), Nov. 15, 1904, *Baker & O'Donovan 4039;* Matanzas (Prov. Matanzas), Feb. 7, 1916, *Britton, Britton & Wilson 13997;* Columbia, Isle of Pines, Feb. 20, 1916, *Britton, Britton & Wilson 14664.*

This species, common in the West Indies, is a short-cycle leptoform, without pycnia. It has been detected on phanerogamic specimens in the herbarium of the N. Y. Bot. Garden, on *Eleutheranthera ruderalis*, near Gerona, Isle of Pines, May 8, 1904, *A. H. Curtiss 488;* Guantanamo Bay, March 17–30, 1909, *N. L. Britton 2243;* on *Tridax procumbens*, Santiago de Cuba, March, 1903, *Underwood & Earle 125;* and on *Neurolaena lobata*, from "Cuba Orientale," 1856–7, *Charles Wright 772.*

The type of *Puccinia solida* B. & C. was collected by Charles Wright in "Cuba Orientale," 1856–7, and the host was first determined in January, 1910, from the specimen in the Curtis herbarium at Harvard University, by B. L. Robinson of the Gray herbarium, who found it to be *E. ruderalis.*

Other West Indian islands now represented are Jamaica, Porto Rico, St. Domingo, Guadeloupe, Martinique, Grenada, Antigua, Barbados, and Tortola, being the most extensive West Indian record for any species of rust up to the present time.

110. PUCCINIOSIRA PALLIDULA (Speg.) Lagerh. Tromsö Mus. Aarsh. **16**: 122. 1894.

ON TILIACEAE:

Triumfetta semitriloba L., Itabo (Prov. Matanzas), Nov. 12, 1915, *Johnston 178;* Ceballos (Prov. Camagüey), Nov. 25, 1915, *Johnston 303;* Minas (Prov. Camagüey), Dec. 2, 1915, *Johnston 372;* Santiago de las Vegas, Dec. 3, 1916, *Johnston 930.*

A short-cycle species, not very conspicuous, and probably more common than the few collections known would indicate. It also occurs in Porto Rico, Jamaica, Guadeloupe, and in Guatemala and South America.

111. ENDOPHYLLUM CIRCUMSCRIPTUM (Schw.) Whetzel & Olive, Am. Jour. Bot. **4**: 49. 1917.

Aecidium circumscriptum Schw.; Berk. & Curt. Jour. Acad. Sci. Phila. **2**: 283. 1853.

Aecidium Cissi Wint. Hedwigia **23**: 168. 1884.

ON VITACEAE:

Cissus sicyoides L., Baracoa (Prov. Oriente), April 14, 1916, *Johnston 502*.

This short-cycle rust has been considered until recently a stage of a heteroecious species. It is known from Jamaica and Porto Rico, and from Panama and the northern border of South America.

112. BOTRYORHIZA HIPPOCRATEAE Whetzel & Olive, Am. Jour. Bot. **4**: 47. 1917.

ON CELASTRACEAE:

Hippocratea volubilis L., Alto Cedro (Prov. Oriente), March, 1903, *Underwood & Earle 1636;* Baracoa (Prov. Oriente), April 15, 1916, *Johnston 633*.

A peculiar white-spored rust, formed on hypertrophied areas. It also occurs abundantly in Porto Rico, but has not been reported elsewhere.

113. **Aecidium Pisoniae** sp. nov.

ON NYCTAGINACEAE:

Pisonia aculeata L., Ceballos (Prov. Camagüey), Nov. 25, 1915, *Johnston 298*.

Pycnia amphigenous, few, on discolored spots, noticeable, subepidermal, globose, 96–128 μ in diameter; ostiolar filaments 64–80 μ long.

Aecia hypophyllous, crowded in groups 3–5 mm. across, cupulate, 0.1–0.2 mm. in diameter; peridium colorless, the margin somewhat recurved, erose, the peridial cells rhomboidal in radial section, 12–16 by 16–34 μ, abutted, the wall evenly thick, 1.5–2 μ, the outer wall smooth, the inner wall very finely and closely verrucose; aeciospores globoid or short-oblong, 15–16 by 16–23 μ; wall nearly colorless, thin, about 1 μ, very finely and closely verrucose.

The rust has been collected only once. Early in July, 1916, the junior author visited the locality where he had first found it the year before, and discovered that the forest had been cut down and burned off preparatory to planting cane. The host is abundant in the vicinity, but no rust could be detected upon other plants of it. The germination of the spores has not yet been studied, and the assignment to the genus is based upon superficial characters only. If correctly placed, it is probably heteroecious.

114. AECIDIUM PASSIFLORIICOLA P. Henn. Hedwigia 43: 168. 1904.

ON PASSIFLORACEAE:

Passiflora rubra L., Ceballos (Prov. Camagüey), July 6, 1916, *Johnston 862*.

This rust appears to be quite local. It has been collected in Porto Rico and Jamaica, and also in Peru, S. A. It is undoubtedly heteroecious. According to observations made by Whetzel and Olive in Porto Rico during March and April, 1916 (Mycologia 9: 75. 1917), it probably is the aecial form of *Puccinia Scleriae* (Paz.) Arth., a rust which has not so far been found in Cuba.

115. AECIDIUM TOURNEFORTIAE P. Henn. Hedwigia 34: 338. 1895.

ON BORAGINACEAE:

Tournefortia hirsutissima L., Baracoa (Prov. Oriente), April 14, 1916, *Johnston 505;* Paso Estancia (Prov. Oriente), May 3, 1916, *Johnston 706*.

Tournefortia peruviana Poir., Ceballos (Prov. Camagüey), July 6, 1916, *Johnston 863*.

The rust is probably the aecial stage of some heteroecious species. It has been observed on a phanerogamic specimen in the herbarium of the N. Y. Bot. Garden, collected at Vento (Prov. Habana), July 1, 1904, *P. Wilson 576*. It occurs also in Porto Rico and in South America.

116. AECIDIUM TUBULOSUM Pat. & Gaill. Bull. Soc. Myc. Fr. 4: 97. 1888.

ON SOLANACEAE:

Solanum torvum Sw., Aguacate (Prov. Habana), March 23, 1903, *Holway;* Jamal (Prov. Oriente), April 21, 1916, *Johnston 513*.

A very abundant rust in some localities in the tropics, and doubtless heteroecious with the alternate form on a grass or sedge. It is known also from Jamaica, Porto Rico, as well as from Central and South America.

117. **Aecidium simplicius** sp. nov.

ON BIGNONIACEAE:

Tecoma pentaphylla (L.) Juss., Taco (Prov. Oriente), April 18, 1916, *Johnston 518*.

Aecia hypophyllous, scattered or indefinitely grouped, cupulate, short, 0.08–0.15 mm. in diameter; peridium white, margin erect, lacerate, the peridial cells rhomboidal, 21–29 μ long, slightly or not overlapping, the outer wall rather thick, 4–7 μ, the inner wall somewhat thinner, 2.5–4 μ, rugose; aeciospores globoid, 21–26 by 25–29 μ; wall colorless, rather thin, 1–1.5 μ, very finely and closely verrucose.

The material on which this species is founded is scanty, being only a few small leaves from seedlings. The aecia on them are, however, quite numerous. In reference to the host, and the place where it was found, the collector has the following to say.

"In regard to the host there seems to be little chance for mistake. The seedlings have 3–5 leaflets identical with those of *Tecoma*. The leaflets are very narrow but so are they on the mature flowering plants in this locality, that is to say on the first branches. The later leaflets become of a normal width. In one case the same fungus was found on one leaf of a plant 2 feet high, while the most of them had only the cotyledonary leaves or perhaps the second and third pair affected.

"The location of this plant was unique—in the basin at the foot of a waterfall about a hundred feet high, with constantly moist condition about the basin. Seedlings were growing on the moss-covered rocks, and mature plants overhanging the boulders in the river. It is regretable that the locality is so isolated."

Assuming that this form is a genuine aecium, for the spores have not yet been germinated, the probability of its being autoecious or heteroecious remains an open question.

118. AECIDIUM FARAMEAE Arth. Bull. Torrey Club 42: 592. 1915.

ON RUBIACEAE:

Faramea occidentalis (L.) A. Rich., San Diego de los Baños (Prov. Pinar del Rio), Aug. 31–Sept. 3, 1910, *Britton, Earle & Gager 6855*.

Only the type collection cited above is known. The germination of the spores has not yet been observed, and it is by no means certain that it is not a species of *Endophyllum*. The more succulent part of the host is often greatly distorted by the rust.

Form-genus UREDO, with paraphyses imbricated to form a pseudo-peridium, or with cells united into a peridial membrane, mostly forms belonging to UREDINACEAE (MELAMPSORACEAE), nos. 119–121.

119. UREDO ARTOCARPI R. & Br. Jour. Linn. Soc. Bot. **14**: 93. 1873.

Physopella (?) *Artocarpi* Arth. N. Am. Flora **7**: 103. 1907.

ON ARTOCARPACEAE:

Artocarpus incisa L.f., Baracoa (Prov. Oriente), April 14, 1916, *Johnston 500*.

Castilla elastica Cerv., Santiago de las Vegas, Jan. 30, 1916, *Johnston 464*.

Heretofore the only American station known for this tropical rust was in Porto Rico on *Artocarpus communis*. Only urediniospores have yet been detected, and its affinities are very uncertain.

120. UREDO COCCOLOBAE P. Henn. Hedwigia **35**: 253. 1896.

ON POLYGONACEAE:

Coccolobis Uvifera (L.) Jacq., Marianao (Prov. Habana), Feb. 6, 1916, *Johnston 440;* Santiago de las Vegas, May 13, 1916, *Johnston 699*.

The rust also occurs in Porto Rico, and in South America.

121. UREDO JATROPHICOLA Arth. Mycologia **7**: 331. 1915.

ON EUPHORBIACEAE:

Jatropha Curcas L., Santiago de las Vegas, Oct. 24, 1915, *Johnston 127;* Saetia (Prov. Oriente), April 8, 1916, *Johnston 514*.

Jatropha gossypifolia L., Soledad, Cienfuegos (Prov. Santa Clara), Nov. 5, 1915, *Johnston 208;* Baracoa (Prov. Oriente), April 14, 1916, *Johnston 587*.

This unconnected form has been found in the phanerogamic herbarium of the N. Y. Bot. Garden on *Jatropha gossypifolia* from Havana, April 7, 1903, *J. A. Shafer 86*, and from Rio Togaba, Trinidad (Prov. Santa Clara), March 15, 1910, *Britton & Wilson 5549*.

The rust is also known from Porto Rico and St. Domingo.

Form-genûs UREDO, with paraphyses absent, or if present, free and peripheral, mostly forms belonging to AECIDIACEAE (PUCCINIACEAE), nos. 122–140.

122. UREDO GYMNOGRAMMES P. Henn. Hedwigia **34**: 337. 1895.

ON POLYPODIACEAE:

Pityrogramma calomelanos (L.) Link (*Gymnogramma calomelanos* Kaulf.), El Yunque, Baracoa (Prov. Oriente), March 10, 1903, *Holway*.

This imperfectly known fern rust has been collected in Jamaica and Porto Rico on numerous hosts.

123. UREDO PASPALICOLA P. Henn. Hedwigia **44**: 57. 1905.
Uredo Stevensiana Arth. Mycologia **7**: 326. 1915.
ON POACEAE:
Bambos vulgaris Schrad., Santiago de las Vegas, Jan. 29, 1916, *Johnston 424*.
Leptochloa domingensis (Jacq.) Trin., Antilla (Prov. Oriente), April 8, 1916, *Johnston 542*.
Paspalum conjugatum Berg., Herradura (Prov. Pinar del Rio), March, 1917, *Horne*.

This imperfectly known, pale-spored, South American rust, recently recognized from Porto Rico and Guatemala, is now first recorded for Cuba. The second Cuban host is a new one for the species.

124. UREDO FUIRENAE P. Henn. Hedwigia Beibl. **38**: 70. 1899.
ON CYPERACEAE:
Fuirena umbellata Rottb., Batabano (Prov. Habana), Oct. 3, 1904, *Baker & Wilson 2214* (host no. *2213*); Herradura (Prov. Pinar del Rio), March 30, 1907, *Earle 652*; Siguanea, Isle of Pines, March 12, 1916, *Britton, Britton & Wilson 15387*.

This imperfectly known rust has been found in Porto Rico, Brazil and India, in each instance on *Fuirena umbellata*, and only with urediniospores.

125. UREDO SUPERIOR Arth. Bull. Torrey Club **31**: 5. 1904.
ON CYPERACEAE:
Fimbristylis ferruginea (L.) Vahl, Saetia (Prov. Oriente), April 8, 1916, *Johnston 646*.

The species is elsewhere known only from Porto Rico.

126. UREDO DIOSCOREAE P. Henn. Hedwigia **35**: 255. 1896.
ON DIOSCOREACEAE:
Dioscorea sp., El Yunque, Baracoa (Prov. Oriente), March 12, 1903, *Holway*.
Rajania cordata L., Toa (Prov. Oriente), April 18, 1916, *Johnston 554*.

The reexamination of all West Indian collections of *Dioscorea*

rust seems to indicate that, while there is some variation as to size of urediniospores and thickness of walls, yet all may be considered to be one species, and also to be the same as the type material of *Uredo Dioscoreae* P. Henn. from Brazil. The surface of the spores is conspicuously echinulate (not "verrucose," as erroneously stated in the Uredinales of Porto Rico (Mycologia 7: 320. 1915)), and the pores indistinct but probably two and equatorial, or somewhat superequatorial.

Puccinia valida Arth., on *Dioscorea convolvulacea*, from Jalapa, Mexico, has uredinia that in both gross and microscopic appearance agree quite well with the West Indian material. The chief differences, aside from being intermixed with the telia, are the darker and thicker walls of some of the urediniospores. There are good reasons for thinking that all the West Indian collections belong to some *Uromyces* or *Puccinia*, possibly to the Mexican species of *Puccinia*.

127. UREDO GYNANDREARUM Corda, Icones Fung. 3: 3. 1839.

ON ORCHIDACEAE:

Habenaria maculosa L.

This imperfectly known orchid rust was observed on a phanerogamic specimen in the herbarium of the N. Y. Bot. Garden, collected on the side and top of El Yunque (Prov. Oriente), Dec. 30, 1910, *J. A. Shafer 7992*. It is known also from Porto Rico and Trinidad, and from Central and South America.

128. UREDO NIGROPUNCTATA P. Henn. Hedwigia 35: 254. 1896.

ON ORCHIDACEAE:

Bletia patula Hook.

This imperfectly known orchid rust was observed on a phanerogamic collection in the herbarium of the N. Y. Bot. Garden, collected upon El Yunque, Baracoa (Prov. Oriente), March, 1903, *Underwood & Earle 929*. It is also known from Porto Rico, Haiti, the Bahamas, and from Florida and South America.

129. UREDO CHERIMOLIAE Lagerh. Bull. Soc. Myc. Fr. 11: 215. 1895.

ON ANNONACEAE:

Annona reticulata L., Santiago de las Vegas, March 2, 1916, *Johnston 492*.

Annona squamosa L., Santiago de las Vegas, June 25, 1916, *Johnston 848*, Nov. 3, 1917, *Johnston 951*.

The species has, heretofore, been known only from Ecuador, S. A., and on *A. Cherimolia*. It is well characterized, and easily separated from other species of *Uredo* on similar hosts, by the thin-walled spores and the greatly thickened extremities of the paraphyses.

130. UREDO BAUHINIICOLA P. Henn. Hedwigia 34: 98. 1895.

ON CAESALPINIACEAE (CASSIACEAE):

Bauhinia heterophylla Kunth, Aguacate (Prov. Habana), March 23, 1903, *Holway;* Guanajay (Prov. Pinar del Rio), Sept. 13, 1904, *Earle 1499;* Candelaria (Prov. Pinar del Rio), Jan. 1917, *Horne*.

The type of this imperfectly known rust was obtained by Ule in Brazil, on *Bauhinia rubiginosa* Bong. It is here first reported for North America. The spores have three equatorial pores, usually to be seen without difficulty. Paraphyses are absent. The form is probably a stage of some *Uromyces*.

131. UREDO HYMENAEAE Mayor, Mém. Soc. Neuch. Sci. 5: 585. 1913.

ON CAESALPINIACEAE (CASSIACEAE):

Hymenaea Courbaril L., Ceballos (Prov. Camagüey), Nov. 26, 1915, *Johnston 296*.

This imperfectly known rust occurs also in Porto Rico and South America. It may belong to the genus *Ravenelia*.

132. UREDO ARACHIDIS Lagerh. Tromsö Mus. Aarsh. 17: 106. 1894.

ON FABACEAE:

Arachis hypogea L., Santiago de las Vegas, Sept. 27, 1915, *Johnston 164*.

This slightly known rust is also reported from Porto Rico, Guadeloupe, and Grenada, as well as from Trinidad and the continent of South America. It has also been sent to the senior author by Mr. W. Robson from Montserrat, British West Indies, where some seasons it has become a menace to the peanut crop.

133. UREDO CABRERIANA Kern & Kellerm. Jour. Myc. 13: 25. 1907.

ON FABACEAE:

Erythrina glauca Willd.

This imperfectly known rust was found in the phanerogamic herbarium of the N. Y. Bot. Garden, collected at Paso Real (Prov. Pinar del Rio), 1906, *Abarca & O'Donovan 2634*. It is known also from Porto Rico and from Guatemala, on the same host.

134. UREDO ERYTHROXYLONIS Graz. Bull. Soc. Myc. Fr. 7: 153. 1891.

ON ERYTHROXYLONACEAE:

Erythroxylon havanense Jacq., San Antonio de los Baños (Prov. Habana), Nov. 21, 1904, *Baker 4127* (Barth. Fungi Columb. *2287*); San Diego de los Baños (Prov. Pinar del Rio), Feb. 7, 1915, *Johnston 174;* Soledad, Cienfuegos (Prov. Santa Clara), Nov. 5, 1915, *Johnston 198;* Santiago de las Vegas, Oct. 24, 1915, *Johnston 131;* Cerros de Vivijagua, Isle of Pines, Feb. 28–29, 1916, *Britton, Britton & Wilson 15023;* Taco Taco (Prov. Pinar del Rio), Sept. 17, 1916, *Johnston 878*.

This imperfectly known species was also detected on a phanerogamic collection of the same host in the N. Y. Bot. Garden, from Sierra de Anafe (Prov. Pinar del Rio), Dec. 28, 1911, *Percy Wilson 11569*. The only other station in North America for this South American rust is on Mona Island, a small island not far from Porto Rico.

135. **Uredo Saviae** sp. nov.

ON EUPHORBIACEAE:

Savia sessiliflora (Sw.) Willd., San Juan, Isle of Pines, March 15, 17, 1916, *Britton, Britton & Wilson 15453*.

Uredinia hypophyllous, scattered, oval or oblong, 0.1–0.3 mm. long, subepidermal, rather tardily naked, cinnamon-brown, ruptured epidermis usually overarching and conspicuous; peridium and paraphyses wanting; urediniospores angularly obovoid, usually triangular above, 16–20 by 23–29 μ; wall cinnamon-brown, thin, about 1 μ, closely echinulate, the pores 3, approximately equatorial, in the projecting angles.

The spores have an unusual appearance from the position of the pores in the three corners. Seen from above the spores appear triangular. They are usually narrowed and sometimes shrunken below the pores, giving a pyriform appearance from the side.

136. **Uredo Sapotae** sp. nov.

ON SAPOTACEAE:

Achras Sapota L. (*Sapota Achras* Willd.), Santiago de las Vegas, March 5, 1916, *Johnston 493* (type).

Uredinia hypophyllous, scattered or somewhat gregarious in close groups of a few each on small discolored areas, 0.5–1 mm. across, oval, 0.1–0.3 mm. long, subepidermal, rather tardily naked, cinnamon-brown, pulverulent, opening by a lateral rupture of the epidermis which remains as an evident flap; peridium and paraphyses none; urediniospores in one view triangular, when revolved one fourth broadly obovate, 18–22 by 21–26 μ; wall cinnamon-brown, moderately thick, 1.5–2 μ, closely echinulate, the pores 2, opposite and close to the hilum, in the obovoid view of the spore seen in the lateral walls.

The same fungus on the same host was collected by E. W. D. Holway at Nassau, Bahamas, March 2, 1903.

137. **Uredo Lucumae** sp. nov.

ON SAPOTACEAE:

Lucuma nervosa A. DC., Santiago de las Vegas, June 25, 1915, O, II, *146* (type), Feb. 23, 1916, II, *490*, March 5, 1916, O, II, *494*, all by *Johnston*.

Pycnia amphigenous, numerous, on discolored spots 5–15 mm. across, punctiform, honey-yellow becoming brown, subcuticular, hemispherical in section, 80–100 μ broad; ostiolar filaments wanting.

Uredinia amphigenous, rarely only hypophyllous, surrounding and among the pycnia on purplish-brown spots, usually crowded, irregularly roundish, 0.1–0.3 mm. in diameter, subepidermal, early naked, pulverulent, the hypertrophied tissues forming a protective structure for the sorus; urediniospores globoid or broadly ellipsoid, 24–35 by 35–42 μ, larger when wet by swelling of the gelatinous layer; wall lamellate, the inner portion firm, golden- or cinnamon-brown, 2–3 μ thick, the outer portion pale, swelling to 4–9 μ thick, the cuticle bearing coarse, conical tubercles, the pores indistinct.

The distinctive character of this rust suggests its relation to *Prospodium* or *Uropyxis*. The *Uromyces Lucumae* Diet., from Brazil, is a wholly unlike species, judging from the description.

138. UREDO OPERCULINAE Arth. Mycologia 9: 95. 1917.

ON CONVOLVULACEAE:

Operculina dissecta (Jacq.) House (*Convolvulus dissectus*

Jacq.), vicinity of Santiago de Cuba, Feb. 14, 1892, *Pollard & Palmer 271.*

This most unusual form of uredinia constitutes a species heretofore known only from the type collection taken in Porto Rico.

139. UREDO CEPHALANTHI Arth. Bull. Torrey Club **29**: 231. 1902.

ON RUBIACEAE:

Cephalanthus occidentalis L., Vivijagua, Isle of Pines, March 18–20, 1916, *Britton & Wilson 15609.*

Until this collection came to hand the species has only been known from the type material from southern Florida. It is an inconspicuous form, with applanate sori and no protecting structures.

140. UREDO PROXIMELLA Arth. Mycologia **7**: 324. 1915.

ON CICHORIACEAE:

Lactuca intybacea Jacq.

This rust has been found on a phanerogamic specimen in the herbarium of the N. Y. Bot. Garden, collected at Guantanamo Bay (Prov. Oriente), March 17–30, 1909, *N. L. Britton 2161.* It is also known from Porto Rico and St. Domingo. The rust appears to belong under the genus *Puccinia*, but no teliospores have yet been discovered.

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